NOTE: See 2011 Discussion Draft
for latest version of Recommended Actions

Oregon's Integrated Water Resources Strategy

DRAFT RECOMMENDED ACTIONS: JUNE 23, 2011

INTRODUCING THE BULLETIN SERIES

What you have before you today is the initial set of draft recommended actions designed to address the most critical issues facing Oregon's water resources. This document contains a series of 12 bulletins, each providing some brief background information, draft recommended actions, and a list of online resources for more information.

The purpose of these bulletins is to continue communicating and engaging with you as we develop Oregon's Integrated Water Resources Strategy. We encourage you to take this opportunity to offer your comments and thoughts on this initial list of actions. You will also find recommended actions at-a-glance on the last page of this document.

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With several months remaining in the project, the Project Team will spend a considerable amount of time developing the final product, modifying the recommended actions where necessary, making each action measurable, attainable, and effective. The recommended actions reflect the themes and issues heard during the 2010 Open House events, stakeholder workshops, Policy Advisory Group meetings, and online surveys. Some of these actions are more detailed than the 2010 discussions. As you think about the issues currently facing your community and these initial recommended actions, consider the following questions:

1. Would these specific actions help to address such problems?
2. Are there other recommended actions that would be more effective in your community? Please elaborate.
3. Are there recommended actions on this list whose unintended consequences (side effects) would outweigh the benefits? Please elaborate.

Please send your responses directly to the Project Team at waterstrategy@wrd.state.or.us or mail to:
Attn: Water Strategy, c/o the Oregon Water Resources Department,
725 Summer Street N.E., Suite A, Salem, Oregon 97301.
Responses are needed by **Wednesday, August 31, 2011**.

The strategy, when finished, will be an action agenda for the state to follow as it prepares to better understand and meet Oregon's water needs (instream & out-of-stream) now and in the future. The approach will be *integrated*, taking into consideration water quantity, water quality, and ecological needs. The intent is to develop a framework, consisting of a set of tools, data, and resources with *statewide* relevance to communities across Oregon.

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BULLETIN 1 OF 12 UNDERSTANDING OREGON'S WATER RESOURCES & SUPPLIES

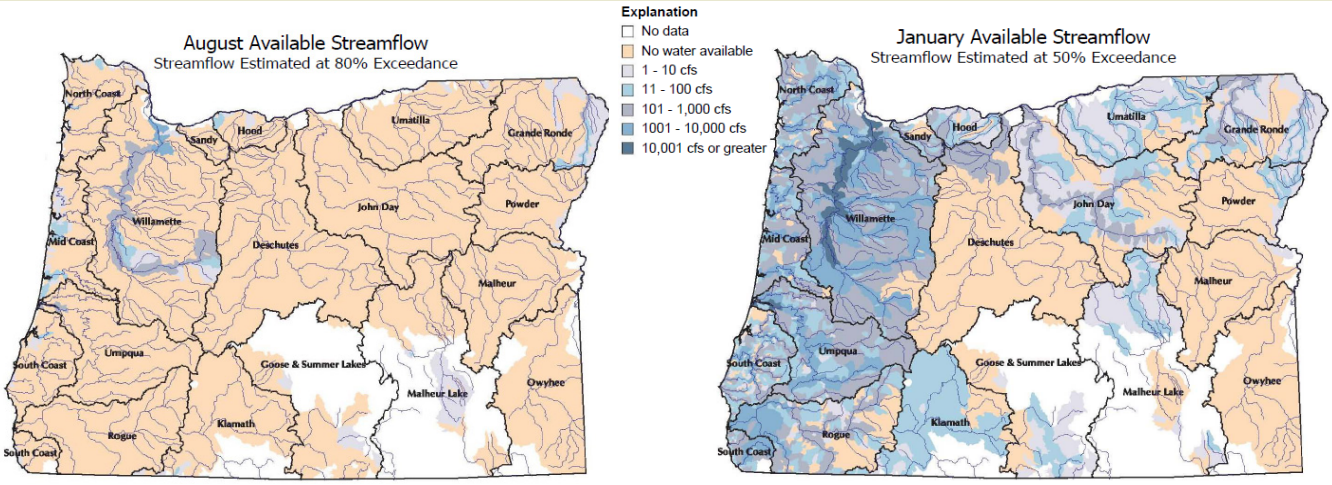
It is the responsibility of local, state, and federal agencies in Oregon to manage water for the protection of existing water users, the environment, and future needs. This, of course, requires robust data collection, processing and sharing.

Oregon's surface water and groundwater resources, by their very nature, are ever-changing. By day, month and year, water resources managers need better data in order to form a more accurate picture of water quality and quantity statewide. Today, there are gaps in data sets that must be addressed, monitoring devices that need to be installed or replaced, and surface water assessment and groundwater investigations that must be completed.

THE STATUS OF OREGON'S SURFACE WATER

Oregon shares three major rivers—the Columbia, Snake, and Klamath Rivers—with surrounding states. There are more than 114,000 miles of rivers and streams in Oregon and more than 1,400 named lakes.

Surface Water Quantity. More than sixty-percent of water rights authorize the use of surface water, while the remaining rights appropriate groundwater or store water. Most of the surface water resources in Oregon are fully allocated during the summer months. This means that very little water is available for new uses today. However, water is available during the winter months for new uses. For example, water users could store available surface water to supply late season or year-round uses. The maps below illustrate water availability during the months of August (a typical low flow month) and January, when flows are typically higher.

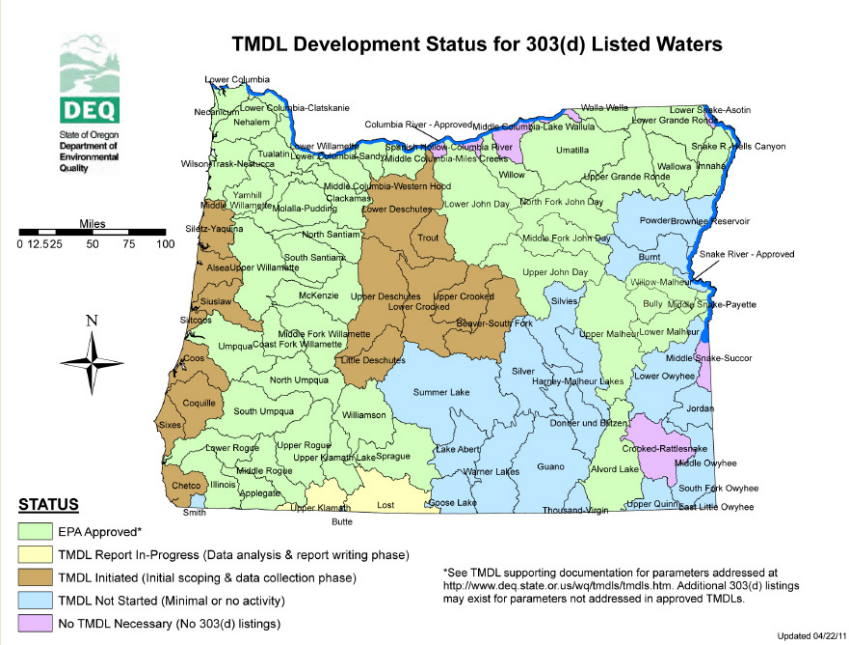


Surface Water Quality. In Oregon today, there are nearly 15,000 miles of streams that do not meet water quality standards for one or more pollutants. Typical pollutants often relate to exceeding temperatures, bacteria, and dissolved oxygen. Water quality has steadily improved in Oregon from 1990 to 2000. Wastewater facility upgrades that included improved streamside vegetation protection

measures likely played an important role in water quality improvements. Over the last ten years, however, there has been a downward trend at many of the long-term monitoring sites, possibly due to the increase in Oregon's population.

Although we are able to identify water quality trends, there are still data and information needs. The levels of some nonconventional pollutants that may be causing water quality problems, such as nutrient and sediment levels have not been adequately defined. There is not enough information on the impacts of toxic pollutants and emerging contaminants such as pharmaceuticals and other personal care products. More information is needed on the cumulative or synergistic effects on water quality and beneficial uses from many of these pollutants. Resources to monitor the effectiveness (on a large scale) of water quality or quantity restoration efforts are inadequate.

Water Quality Management. Under the federal Clean Water Act, the Oregon Department of Environmental Quality (DEQ) must identify water bodies that do not meet water quality standards and develops water quality plans called Total Maximum Daily Loads (TMDLs). TMDLs describe the maximum amount of pollutants allowed from municipal, industrial, commercial, and surface runoff sources, including natural background that can enter waterways without violating water quality standards. Implementing a TMDL often involves revising industrial and municipal wastewater permits to incorporate new discharge limitations. DEQ has already completed 1,013 TMDLs and has plans to develop TMDLs for the Deschutes, Mid Coast, and then Coquille regions.



TMDL implementation plans describe actions that will be taken to reduce pollution. For agricultural and rural residential lands, water quality plans are developed as part of Oregon Department of Agriculture's Water Quality Management Act. On state and private forestlands, the Department of Forestry has the lead in providing water quality protection through the Forest Practices Act and long range management plans. In urban areas, local governments develop TMDL implementation plans. The U.S. Forest Service and the U.S. Bureau of Land Management are responsible for developing water quality restoration plans for lands under their jurisdiction. Under most circumstances, TMDL implementation plans for improving water quality rely on cooperation among landowners and land managers within a river basin. Local watershed councils, soil and water conservation districts, or other organizations serve as community-based coordination points for these efforts.

Monitoring Surface Water. Interpreting surface water data can be complicated and labor intensive. It involves measuring the timing and duration of given flows, as well as understanding the relationship between flows and water quality conditions. Although some data sets are captured in near real-time, it may take several months or even years before they are fully processed.

A complete understanding of Oregon's surface water resources also involves data on habitat-limiting factors that may or may not be related to flow quantity or quality (e.g. channel morphology, substrate, and fish passage issues). Additionally, an understanding Oregon's water-related infrastructure may require an asset management

approach (see discussion in Bulletin 7: Water Related Infrastructure). Discussion of Oregon's ecosystem health can be found in Bulletin 12.

More than 500 surface water gages throughout Oregon serve as the backbone of water management. These gages are owned and operated by a variety of public and private entities. At the state and federal level, these gages help to: determine the availability of water for further appropriation, monitor drought and flood conditions, assess the status of conventional and toxic pollutants, develop pollution prevention strategies, understand groundwater/surface water interactions, and distribute water among users. In many locations, these gages provide near real time access to data through telemetry or satellite. Staff review the data, make corrections based on field observations, and then finalize the records to U.S. Geological Survey standards.
The resulting data also help to accomplish the following:

- Coordinating water releases from dams;
- Gathering fish habitat information;
- Planning recreational activities;
- Monitoring effects of streamflow restoration projects;
- Scheduling water deliveries to customers;
- Designing dams, bridges, dikes, and roads; and
- Acting as drought and flood early-warning systems

The Oregon Water Resources Department (WRD) is conducting an evaluation of Oregon's gaging network to determine how effective the gages are for water regulation and distribution. The evaluation will help identify where gages should be placed in the future as funding becomes available. In future evaluations, WRD plans to examine the state's network to further any long-term trend analysis (i.e., climate change) or other needs. Currently, the Department lacks sufficient financial resources to install, maintain, and process data from surface water gages in a timely manner.

THE STATUS OF OREGON'S GROUNDWATER

Groundwater resources support out-of-stream needs and provide baseflow to streams and ecosystems that rely on near-surface water tables. Management decisions addressing groundwater have the potential to affect the entire groundwater flow path from recharge area to discharge area.

Groundwater Quantity. Oregonians have become increasingly dependent on groundwater. This dependency has stressed groundwater resources in several areas of the state. Aquifers in the Columbia River Basalt Group are the Department's foremost "aquifers of concern" for long-term supplies, extending from Eastern Oregon, through The Dalles, and into the Willamette Valley.

Significantly decreasing groundwater levels has led to administratively designating groundwater management areas as either "groundwater classified," "critical areas," or "withdrawn areas." Although groundwater development is an option for new uses in many areas of Oregon, the opportunities are shrinking. In many instances, groundwater applications are denied or limited because they are proposing use from aquifers that can substantially interfere with a fully appropriated surface water source.

Effective Groundwater Management

Effective management of groundwater resources requires an understanding of:

- the geometry of the aquifer system (geologic framework and boundaries);
- the source of recharge (rainfall, snowmelt, canal losses, etc);
- the nature of discharge (to surface waters, evapotranspiration, wells, etc); and,
- the stability of the resource (does the system appear to be in equilibrium or is it displaying signs of overdraft?).

The Oregon Water Resources Department evaluates groundwater supplies at the basin scale through a cooperative science program with the U.S. Geological Survey (USGS). These groundwater studies are iterative and ever evolving. They begin with a "first pass" that develops a water budget for each basin, showing overall volumes of groundwater recharge, discharge, and available water. The Department has completed a "first pass" in three basins in Oregon: the Deschutes Basin, the sedimentary aquifers of the Willamette Basin, and the Upper

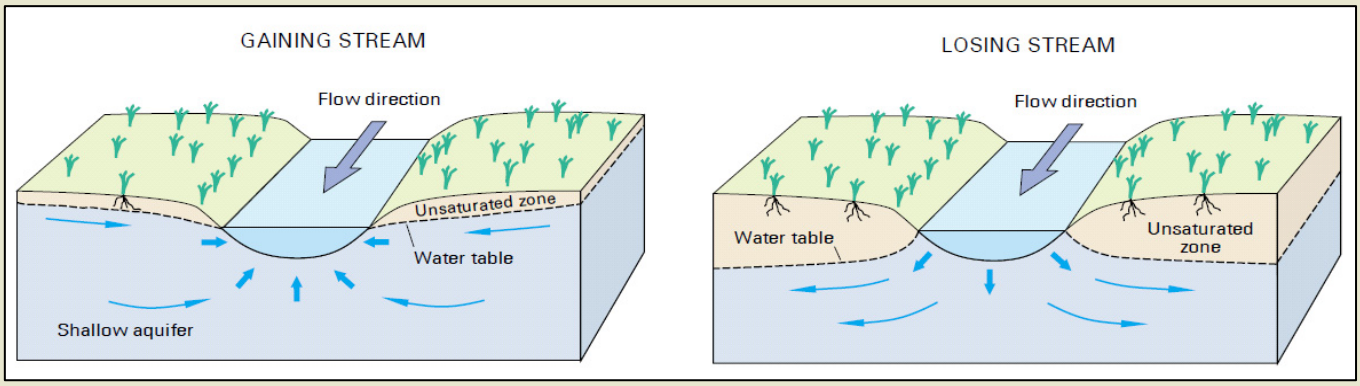
Klamath Basin. Future basin work needs to focus on: the Umatilla Basin, together with its Walla Walla Sub-Basin, Hood Basin, Eastern Deschutes, Harney Basin, the Columbia River Basalt Group aquifers of the Willamette Basin, Sandy Basin, Grande Ronde Basin, Powder Basin, and the Goose and Summer Lakes Basin. These investigations are dependent on available funding to conduct these projects through the USGS Cooperative Program (a money-match program). As more questions arise or trends emerge (e.g., a focus on "climate change"), the Department updates studies and conducts a "second pass," asking and answering new sets of questions about each basin.

Groundwater Quality. Between 1980 and 2000, the DEQ conducted 45 groundwater quality assessments. These assessments covered approximately 6.4 percent of the total land area of the state, and 30.8 percent of the area in Oregon where groundwater is used. The assessment data provide a general rating of the overall quality of the groundwater resource available in Oregon for use as drinking water. The data show nitrates are the most commonly detected contaminants, followed by pesticides, volatile organic compounds, and bacteria. DEQ evaluates impairment by comparing the levels of detected contaminants to the federal drinking water standards. However, many organic chemicals, pesticides, and herbicides do not have drinking water standards and the detection of any level of these contaminants in groundwater indicates a potential concern. In 35 of the 45 studies completed, the assessment results show some impairment or reason for concern. In Oregon, the detection of contaminants in groundwater at one-half the drinking water standard, or at 70 percent of the nitrate drinking water standard, can be the basis for declaring a Groundwater Management Area.

Nitrate levels in groundwater exceed drinking water criteria in several areas of the state, including the Willamette Valley, Rogue and Deschutes Basins, lower Umatilla Basin and northern Malheur County. Nitrate conditions in agricultural landscapes are significantly more impaired than forestlands. Historically, DEQ has not had the resources needed for conducting a statewide groundwater quality assessment and monitoring program for nitrates or other contaminants.

CONJUNCTIVE MANAGEMENT OF SURFACE WATER AND GROUNDWATER

A better understanding of groundwater budgets helps quantify important relationships, such as the groundwater contribution to surface water and vice versa. Surface water interacts with groundwater in three basic ways: (1) streams gain water from inflow of groundwater, via springs or seepage, through the streambed (gaining streams), (2) streams lose water to groundwater by outflow through the streambed (losing streams), or (3) they do both, gaining in some reaches and losing in others. Gaining streams represent locations where cooler groundwater



Courtesy of USGS, 1998 publication

emerges and contributes to a stable base flow, helping to sustain flows during the summer months, and providing prime spawning conditions. Losing streams can act as a potential route of groundwater contamination, as polluted runoff enters streams that eventually percolate back into the ground.

In Oregon today, many of our laws recognize the interconnection of groundwater and surface water. For example, interference between groundwater uses and existing surface water uses is prevented and/or controlled to protect the resource and senior water users. Other examples of conjunctive management include Aquifer Storage & Recovery and Artificial Groundwater Recharge projects, where surface water is captured during high flows and stored underground for later use. For more information on these projects in Oregon, see "Bulletin 11: Water Management."

Managing surface water and groundwater in a coordinated way, or conjunctively, remains a challenge. A lack of data that describes the connection between groundwater and surface water results in an incomplete understanding of available water, groundwater recharge, gaining versus losing reaches, return flows, and sources of contamination, limiting our ability to maintain sustainable water supplies.

CONCLUSION

Incomplete datasets and the inability to completely process and communicate data hinder our ability to make informed resource management decisions. The lack of stable resources to conduct groundwater studies, maintain sufficient surface water gaging stations and process records is an issue today. At one time, the Water Resources Department had a budget of more than $1 million per biennium for these activities; currently, there are no funds dedicated to this purpose.

Robust water data provide a firm foundation for agency planning, decision-making and program implementation. As water issues become more complicated and competition over remaining available resources intensifies, however, water resources data will be subject to increasing scrutiny and challenges.

Draft Recommended Actions

The following *draft* recommended actions are aimed at improving our understanding of the status of water resources today. These actions reflect themes and ideas heard from Oregonians during the 2010 Open House events, stakeholder workshops, Policy Advisory Group meetings, and online surveys. Each numbered action has a series of bulleted items below it, meant to give an idea or example of how such an action could be implemented.

You may also see these symbols following a recommended action:

- = Key, high priority, concept
- = Ongoing need for applied research.
- = Legislation or rule-making likely required

[ ] = Contains more information, such as identifying lead or coordinating agencies or cross-referencing to other actions.

Your feedback on these actions, the bulleted items, and the related symbols is very important to us. Please send any comments or questions directly to the IWRS Project Team at waterstrategy@wrd.state.or.us by Wednesday, August 31, 2011.

ACTION 1.A: "MAP" OREGON'S WATER-RELATED INSTITUTIONS

There are more than 15 state agencies whose responsibilities touch upon some aspect of water management and data collection, as well as dozens of federal agencies and hundreds more private and local entities. Document the major agencies involved in water management and supply in Oregon, describing their areas of responsibility and available data sets to further integrate across jurisdictions and improve coordination. [State - Universities]

ACTION 1.B: FILL IN DATA GAPS IN SPECIFIC ISSUE AREAS

Collect and process data, and share more information related to the state's water resources, in order to determine how best to meet Oregon's water needs. This is a long-term funding commitment in the area of surface water and groundwater data collection, monitoring, and studies. Basin-led efforts could help prioritize the funding of water quality and quantity data collection [See Action 10.c]. Generally, agencies have identified the following statewide priorities. [State – Federal – Local]

- Conjunctive Management of Groundwater and Surface Water.
  - ~ Further our understanding of the relationship between groundwater and surface water. State and federal agencies have already undertaken three basin-wide groundwater investigations in Oregon, and future investigations are planned. [WRD – USGS]
  - ~ Maintain and install additional surface and groundwater monitoring systems in prioritized areas, for both water quantity and quality.
  - ~ Collect information about "other" habitat conditions, such as channel morphology, substrate, and fish passage issues.
  - ~ Monitor changing surface water and groundwater conditions related to climate change [see Climate Change Action 5.a]. Establish new surface water gages and monitoring wells, where appropriate.
- Integrate Water Quality and Water Quantity Efforts.
  - ~ Fully incorporate water quantity into DEQ's TMDL requirements. [DEQ]
  - ~ Monitor and evaluate pollutants that do not yet have water quality standards, but that are present in Oregon and of concern (e.g., nutrients, sediments, emerging contaminants, toxics)
  - ~ Evaluate ecosystem health as it relates to water quality and quantity [see Action 12A-D].
  - ~ Evaluate wetland, riparian, and other restoration mitigation programs for the purposes of identifying best management practices. Identify future restoration and mitigation projects with the greatest potential to improve water quality and quantity; utilize funds from the Oregon Watershed Enhancement Board to do so.
- Integrate Federal, State, and Local data collection efforts [See Action 10.C]. Use OWEB and other grant monies to provide training to local partners, in data collection methodology, to ensure more data collection and wider application of data.

Online Resources for More Information

Below are useful resources that contain additional background information on this topic. With the exception of our own publications and sites, the IWRS Project Team makes no endorsement of the information provided below.

GROUNDWATER AND SURFACE WATER - A SINGLE RESOURCE
This general educational document, from the U.S. Geological Survey, presents an overview of the current understanding of the interaction of groundwater and surface water, in terms of both quantity and quality, as applied to a variety of landscapes across the Nation. http://pubs.usgs.gov/circ/circ1139/pdf/circ1139.pdf

"TOOLS & DATA" FOR WATER RESOURCES
The Oregon Water Resources Department maintains a site, where you can find water quantity data for surface water and groundwater, an inventory of hydroelectric projects in Oregon, information on the Department's water availability program, and more. http://www.wrd.state.or.us/OWRD/PUBS/ToolsData.shtml

OWRD'S GROUNDWATER STUDIES
Since the 1960s, the Oregon Water Resources Department has published a variety of groundwater reports and publications at the state, basin, and sub-basin levels. http://www.wrd.state.or.us/OWRD/GW/gw_pubs.shtml

DESCHUTES BASIN GROUNDWATER STUDY
In cooperation with the Oregon Water Resources Department, the Cities of Bend, Redmond, and Sisters, Deschutes and Jefferson Counties, and the Confederated Tribes of the Warm Springs Reservation of Oregon, the U.S. Geological Survey published this study as a series of five USGS publications as well as several articles and abstracts.
http://or.water.usgs.gov/projs_dir/deschutes_gw/index.html

THE UPPER KLAMATH BASIN GROUNDWATER STUDY
The Oregon Water Resources Department and U.S. Geological Survey partnered on a study to develop and test a conceptual understanding of the ground-water flow system of the upper Klamath Basin.
http://or.water.usgs.gov/projs_dir/or180/

WILLAMETTE BASIN GROUNDWATER STUDY

The Oregon Water Resources Department and US Geological Survey partnered on a study that provides a quantitative understanding of the regional groundwater flow system in the Willamette Valley. Additional components included an analysis of the depletion caused by groundwater pumping, a characterization of basalt aquifers within the Willamette Valley, an understanding of well yield, and an assessment of naturally occurring poor-quality groundwater. http://or.water.usgs.gov/projs_dir/willgw/willpage.html

OREGON'S 2010 INTEGRATED REPORT (DEQ)

Every two years, DEQ is required to assess water quality and report to the U.S. Environmental Protection Agency on the condition of Oregon's waters. DEQ prepares an integrated report that meets the requirements of the federal Clean Water Act (CWA) for Section 305(b) and Section 303(d). Visit the site to learn more about how the Report is developed and what it contains. http://www.deq.state.or.us/wq/assessment/assessment.htm

TOXICS MONITORING IN THE WILLAMETTE WATERSHED

The Oregon Department of Environmental Quality received funds from the 2007 Oregon Legislature to establish a watershed-based toxics monitoring program for Oregon's waters. Implementation of the program began in early 2008 with an initial focus on the Willamette Basin. Learn more at DEQ's website:
http://www.deq.state.or.us/lab/wqm/toxics.htm

TOTAL MAXIMUM DAILY LOADS

This site contains links to Total Maximum Daily Load (TMDL) and Water Quality Management Plan (WQMP) documents prepared for waterbodies in Oregon designated as water quality limited on the 303(d) list. A TMDL is the calculated pollutant amount that a waterbody can receive and still meet Oregon water quality standards.
http://www.deq.state.or.us/WQ/TMDLs/TMDLs.htm

ADDRESSING "PRIORITY PERSISTENT POLLUTANTS"

DEQ's web site provides information on Senate Bill 737 (2007), which requires the state to develop a list of priority persistent bioaccumulative toxics (Priority Persistent Pollutant List) that have a documented effect on human health, wildlife and aquatic life. http://www.deq.state.or.us/wq/SB737/index.htm

FACT SHEET: WATER QUALITY MONITORING PROGRAMS AT OREGON DEQ

This DEQ Fact Sheet describes how water quality data is collected and used in Oregon.
http://www.deq.state.or.us/lab/wqm/docs/08-LAB-007.pdf

WATER QUALITY & GROUNDWATER

Under the state's Groundwater Protection Program, DEQ provides ongoing monitoring and assessment of groundwater management areas throughout the state. On this page, you will find various links to information on groundwater management areas, groundwater pollutants, technical information, and several legislative reports on groundwater quality in Oregon. http://www.deq.state.or.us/wq/groundwater/publications.htm#Gwma

OREGON EXPLORER

Oregon Explorer provides a web-based natural resources digital library by integrating data from state and federal agencies, local governments, university scientists, and citizens. A collaboration between Oregon State University (OSU) Libraries and the OSU Institute for Natural Resources, Oregon Explorer helps inform decisions and actions affecting Oregon's natural environment. http://www.oregonexplorer.info/

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BULLETIN 2 OF 12 UNDERSTANDING OREGON'S OUT-OF-STREAM NEEDS

Out-of-stream needs represent those uses that divert water from a stream, reservoir, or from below ground to serve a beneficial purpose. Uses that divert water are often considered "consumptive uses." The major uses of diverted water in Oregon are municipal use, industrial use, and irrigation use.

A recent assessment of water needs calculated Oregon's 2008 total statewide water demand as approximately 9.1 million acre feet, and estimated that by 2050, the total water demand would increase to about 10.3 million acre-feet, based on projected growth in the municipal, domestic, industrial, and agricultural sectors. An additional one million people are expected to arrive in Oregon by 2030, representing a twenty-five percent increase in Oregon's population. How much water is used, and how it is managed, will be affected by a growing population.

HOW WATER IS USED

Water directly supports Oregon's diverse economy. Based on a 2008 water demand forecast, irrigation for agricultural production accounts for about 87 percent of diverted water use in Oregon. Municipal use accounts for 6 percent. Water used for industrial purposes accounts for 6 percent as well. Private or self-supplied domestic water use represents one-percent of water used in Oregon.

Agricultural Use. According to the Oregon Department of Agriculture, irrigated farms produce more than 80 percent of the total value of Oregon's harvested crops. Fifteen percent of all economic activity in Oregon is tied to agriculture, accounting for more than 22 billion dollars in Oregon's net state product.

Oregon's 200 food processors account for an additional $3 billion in value-added sales revenue, and play an essential part in food production by cooking, freezing, and packaging products for consumers. The food processing industry handles crops from cherries to onions and includes bakery and dairy products, fruits and vegetables, meat, poultry, and seafood. This is a water-intensive industry water is needed for washing, processing, and packaging food. Finding a fresh water supply to meet the needs of this industry is sometimes a challenge.

Municipal Use. Municipal water providers in Oregon deliver drinking water to about 88 percent of the state's population. In addition to providing safe and reliable source of water, which directly protects public health, water providers also supply water for fire suppression, economic development activity, and quality of life. These water providers supply households, businesses, schools, parks, hospitals and more. Municipal suppliers are responsible for forecasting water demands and providing service to all who locate within their service territory. They estimate the growth that might occur five, ten, even 50 years into the future and they must be ready to serve that need. The largest municipal demands are in Multnomah, Washington, Clackamas, Lane, Jackson, Marion, and Deschutes Counties, which have the fastest population growth rates in the state. These same counties are projected to continue to have the greatest increase in municipal water demand through the year 2050.

Industrial Use. The high tech manufacturing sector, the focus of intense recruiting efforts in Oregon, is another water-intensive industry because of the volume of water needed for cleaning and cooling. (One of the largest semiconductor chip manufacturers in Oregon reports using almost 10 gallons of water, much of it recycled, to produce a semiconductor chip one square centimeter in size.) In addition, the highly toxic chemicals used in the manufacturing process pose challenges for wastewater treatment and disposal.

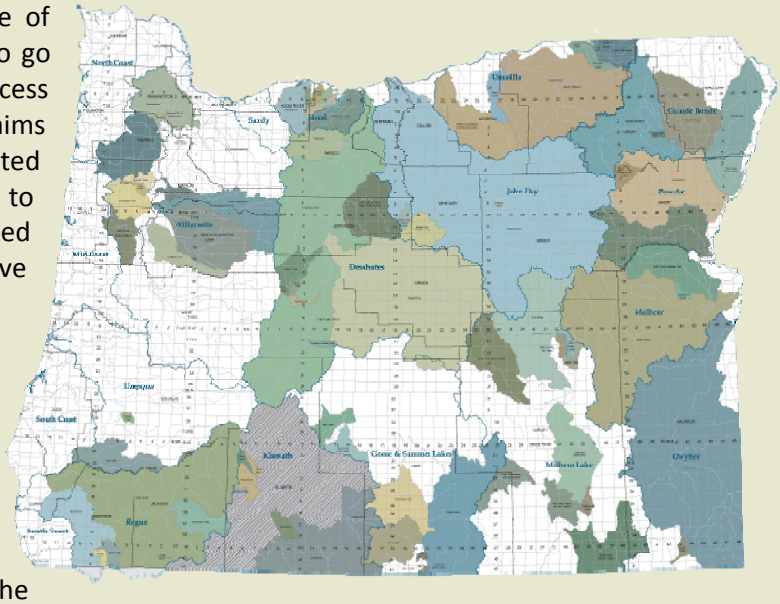
HOW WATER IS MEASURED

Good water management decisions are made possible when they are based on reliable information about water resources. Water use data is a fundamental tool for the Water Resources Department for proactive water management. Water use measurement devices provide valuable information necessary for effective water distribution and to help plan for future water needs.

In 2000, the Water Resources Commission developed a strategy for improving water measurement statewide. Implementing the Strategy involved identifying approximately 2,200 significant diversions around the state that account for about 50 percent of the volume of water diverted in Oregon. The Water Resources Department is now working with landowners, as well as local, state, and federal partners to install measurement devices on these significant diversions. Having adequate incentives in place for landowners will be key to successful installation.

HOW WATER IS ADJUDICATED

Passage of the Water Code in 1909 established, for the first time in Oregon, a centralized administrative system for acquiring, certifying and documenting rights to the use of water. These water rights are then managed within a prior appropriation system of water allocation. Holders of vested water rights established prior to 1909, including those claimed by Indian tribes by virtue of treaties with the U.S. government, are required to go through a formal administrative/judicial process known as adjudication, to have their water right claims quantified, documented and eventually incorporated into the prior appropriation system. The ability to manage water resources has been greatly facilitated in those areas of the state where adjudications have been concluded.



However, large areas of the state, such as Klamath River Basin, have not yet been adjudicated. The administrative phase of the Klamath Adjudication, underway since 1975, is scheduled for completion in late 2012 or early 2013. Completion of this phase will greatly enhance the ability to manage water resources in the region. The remaining unadjudicated areas of the state (white areas on the map), which consist primarily of river basins located west of the Cascades, must be completed. Completing the adjudication process in the Klamath Basin, and other basins, is an important component of water management for a variety of reasons. By quantifying the use of water, water managers have a better understanding of what water is being used and for what purposes. Without a complete picture of water allocations in a basin or on a particular stream, is it difficult to effectively distribute or regulate water use during times of shortage, shut off unauthorized uses, or to determine the amount of water available for futures uses. By creating a record of enforceable water rights through the adjudication process, water users have greater security, predictability, and flexibility in meeting their own needs.

NOTE: See 2011 Discussion Draft for latest version of Recommended Actions

Draft Recommended Actions

The following *draft* recommended actions are aimed at improving our understanding of out-of-stream needs. These actions reflect themes and ideas heard from Oregonians during the 2010 Open House events, stakeholder workshops, Policy Advisory Group meetings, and online surveys. Each numbered action has a series of bulleted items below it, meant to give an idea or example of how such an action could be implemented.

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ACTION 2.A. UPDATE LONG-TERM WATER DEMAND FORECASTS

- Update the Statewide Demand Forecast. Update the Department's fifty-year forecast of water needs across sectors and locations (state, basin, and county levels). Identify trends in economic development, irrigated agriculture, urban-rural population growth/shift, future industrial and energy needs, and more. Survey planners and economic recruitment officers as part of this process. Some stakeholders take this recommendation further, calling for the state to create standards to evaluate claims of demand and publish common standards for water demand forecasts. [WRD – Local – OUS]
- Improve the long-term water demand forecast by enhancing the state's water-use reporting program and coordinating with the U.S. Geologic Survey to compile consistent water-use information. [WRD – USGS]
- Develop models / studies on the "economic value of water to Oregon." This information is of critical importance to the U.S. Bureau of Reclamation and other major funding agencies, where economic information is needed to assess the cost-benefit of potential water resource projects or proposals.
- Establish Legislative requirements and funding for five-year updates to these comprehensive forecasts.

ACTION 2.B. IMPROVE WATER-USE MEASUREMENT

- Increase investments and partnerships in qualified staff, measuring equipment, and real-time access to data in order to measure significant diversions in high priority watersheds. Partner with the Bureau of Reclamation, Bonneville Power Administration, and the USDA-Natural Resources Conservation Service to help fund the purchase and installation of measurement devices. Conduct follow-up inspections to ensure that measurement devices are properly installed and maintained. [State – Federal – Local]
- Conduct studies to determine the average demands of exempt well use. [See Land-Use Action 6B]
- Determine how remote sensing technologies could help to better define water use in data-limited or problem areas. [WRD – Federal – Local]
- Encourage corporations in Oregon to participate in the Carbon Disclosure Project's (CDP) Water Disclosure Project (see link below).

ACTION 2.C. COMPLETE WATER RIGHT ADJUDICATIONS

Complete areas of the state that have not undergone the adjudication process, including reserved water right claims that still exist for tribal or federal lands.

Online Resources for More Information

Below are useful resources that contain additional background information on this topic. With the exception of our own publications and sites, the IWRS Project Team makes no endorsement of the information provided below.

STATEWIDE WATER NEEDS ASSESSMENT

A first-generation water demand-forecasting model was developed as part of the 2008 Oregon Water Supply and Conservation Initiative. Visit this site to learn more about the Initiative, to access the forecasting tool, as well as access the statewide water needs assessment report. http://www.wrd.state.or.us/OWRD/LAW/owsci_info.shtml

STRATEGIC MEASUREMENT PLAN

In 2000, the Water Resources Commission developed a strategy to improve water measurement statewide. It focuses on diversions with the greatest impact on streamflows in areas with the greatest needs for fish. The Department has developed a statewide inventory of significant diversions within high priority watersheds and is working to increase measurement at these diversions. http://www.wrd.state.or.us/OWRD/mgmt_measure.shtml

WATER USE DATA

The Oregon Water Resources Department requires federal and state agencies, cities, counties, schools, irrigation districts and other special districts to record water use monthly and report the data on an annual basis. Water use data for government entites can be accessed online. http://apps.wrd.state.or.us/apps/wr/wateruse_report/ The U.S. Geological Survey also compiles water use information for major water use sectors on a five-year basis. The USGS water use data is also accessible online. http://or.water.usgs.gov/projs_dir/or007/or007.html

WATER DISCLOSURE PROJECT

CDP Water Disclosure provides water-related data from the world's largest corporations, informing the global marketplace on investment risks and opportunities. https://www.cdproject.net/water-disclosure

FARM AND RANCH SURVEY

USDA – National Ag Statistics Service Census of Agriculture, Farm and Ranch Irrigation Survey.
http://www.agcensus.usda.gov/

OREGON AGRICULTURE AND THE ECONOMY

Oregon State University Extension Service, February 2011. This document provides a profile of agriculture, estimates agriculture's "economic footprint," and calculates the extent to which Oregon's economy depends on agriculture.
http://ruralstudies.oregonstate.edu/sites/default/files/pub/pdf/OregonAgEconomyAnUpdate.pdf

OREGON AGRICULTURE: FACTS AND FIGURES

This Oregon Department of Agriculture brochure provides many of the most common Oregon agricultural statistics, including crop production, county farm and ranch sales, commercial fish landings, and value of agricultural exports.
http://oregon.gov/ODA/docs/pdf/pubs/ff.pdf

KLAMATH BASIN ADJUDICATION

The website offers an overview, including the status and various statistics, of the Klamath Basin adjudication. A 1999 general report of the water uses and water issues in the basin as told through some of the Basin's water officials and citizens is available on this site. The report also includes a general look of at the history, geology, and hydrology of the Basin. http://www.wrd.state.or.us/OWRD/ADJ/index.shtml

BULLETIN 3 OF 12 UNDERSTANDING OREGON'S INSTREAM NEEDS

With more than 114,000 miles of river and streams and more than 1,400 lakes, water resources contribute greatly to Oregon's "instream" economy by providing endless recreational opportunities, serving as scenic attractions, and by supporting aquatic habitat, in which species live and thrive. Ensuring sustainable fisheries is important for Oregon as it provides both economic and social benefits to Oregonians.

Recreation and Transportation. A recent study found that, in 2008 alone, nearly 2.8 million people spent time hunting, fishing, boating, and viewing wildlife in Oregon, spending 2.5 billion dollars. This money supports local businesses, such as hotels, restaurants, and outdoor equipment outfits. Many Oregon counties, such as Harney, Lake, Morrow, and Wheeler County, receive a significant boost to their local economy from those who travel to participate in fish and wildlife recreation activities.

The economic contribution of fish and wildlife recreation speaks to the importance of protecting water instream. Without adequate water within the system, these uses and benefits are threatened. There are other uses too that benefit from adequate flows, such as navigation and transportation. The Columbia River, for example, is the largest wheat exporting transportation system in the nation.

Ecosystem Health. Along with supporting the economy, water is needed instream to ensure overall ecosystem health. The Nature Conservancy's 2007 report, *Groundwater and Biodiversity Conservation*, notes that some ecosystems, such as springs, and some rivers, lakes, and wetlands depend on the discharge of groundwater to the surface. By comparison, other ecosystems such as forests and riparian areas are more dependent upon water tables that lie close to the surface. Aquifer and subterranean ecosystems are reliant on groundwater below the surface.

Fish and Habitat. The health of an "indicator species," like the proverbial "canary in the coal mine" can be an indicator of overall ecosystem health, and can offer early signs of stress, such as disease or pollution. Oregon's streams and lakes provide habitat that is essential for fish and wildlife to live, reproduce, and thrive. Out of numerous species that depend on Oregon's water resources, the most visible indicator species are native salmonids (salmon, steelhead, and trout), which depend on cold clean water. Using these species as indicators of overall aquatic ecosystem health paints a dire picture. Since 1991, NOAA Fisheries' Office of Protected Resources has listed 27 Pacific salmonid species under the Endangered Species Act (ESA), and has delisted zero species. Many populations of Chinook, Coho, Chum and Steelhead are at a fraction of their historic levels and listed as threatened or endangered. In 2005, the Oregon Department of Fish and Wildlife published a Native Fish Status Report, noting that of 69 "Species Management Units," a population count of Oregon native fish species, 35 SMUs were "at risk," and nine were already extinct.

There are certain stream conditions that are necessary to support the life cycle of fish species. The need for certain stream conditions varies by species. Coho, for example, need gravels that are clean with various sizes to create nests and deposit their eggs. Coho prefer to spawn and rear in small, relatively

flat streams. Cool water is a requirement for rearing, as well. Wetlands, off-channel ponds, and other slackwater areas provide small fish (fry) with safe areas to reside in during the winter season when the current is swift. The complexity of the habitat, which includes both large and small woody debris, directly contributes to the health and function of salmon bearing streams.

Data Gaps. Oregon's ability to meet instream needs is limited by our own understanding of these needs. While we know that ecosystems and species depend upon both surface water and groundwater, we do not fully know all of the ecological functions that rely on groundwater and surface water. Nor have we fully quantified the ecological degradation that occurs with differing qualities and quantities of water.

We currently lack a comprehensive understanding of the base flows needed to support fish habitat. Base flows represent the low flow functions of a stream that provide minimal direct habitat for fish and other aquatic organisms. They can also represent minimal flows that are sufficient in quantity to overcome the potential for threats to aquatic life from pollutants or increased water temperature. Today, there is not much information about base flow needs for species other than the high profile salmonid species (other species being lamprey, chub, white fish, other native fish species, amphibians, macro-invertebrates, etc.).

More information is needed, regarding what elevated flows are necessary to maintain the physical characteristics of a stream or to trigger biological processes. Instream water rights in Oregon today have been designed to address situations of low flow and they focus almost exclusively on depth, velocity, and substrate criteria; generally, instream water rights do not focus on protecting elevated streamflows.

Draft Recommended Actions

The following *draft* recommended actions are aimed at improving our understanding of instream needs. These actions reflect themes and ideas heard from Oregonians during the 2010 Open House events, stakeholder workshops, Policy Advisory Group meetings, and online surveys. Each numbered action has a series of bulleted items below it, meant to give an idea or example of how such an action could be implemented.

You may also see these symbols following a recommended action:

🔑 = Key, high priority, concept
📖 = Ongoing need for applied research
⚖ = Legislation or rule-making likely required

[ ] = Contains more information, such as identifying lead or coordinating agencies or cross-referencing to other actions.

Your feedback on these actions, the bulleted items, and the related symbols is very important to us. Please send any comments or questions directly to the IWRS Project Team at waterstrategy@wrd.state.or.us by Wednesday, August 31, 2011.

ACTION 3.A. COMPLETE OUR UNDERSTANDING OF FLOWS NEEDED TO SUPPORT STREAM FUNCTIONS 📖

- Base Flow Needs Studies. Identify which streams already have these studies, then prioritize and complete those that are still needed and those that need updates. Base flows are the instream flows needed to sustain basic life stage functions and are important for maintaining habitat, scenic waterways, water quality, and recreational needs. [ODFW – WRD – DEQ – OPRD]

- Elevated Flow Needs Studies. Conduct studies on a basin-by-basin or on a project-by-project basis to collect information about the elevated flows needed to maintain and restore stream channel complexity and ecological functions. [ODFW – WRD]

ACTION 3.B. IMPROVE OUR UNDERSTANDING OF THE RELATIONSHIP BETWEEN GROUNDWATER & ECOSYSTEM NEEDS* 🕮

- Prioritize springs for further analysis, using U.S. Fish and Wildlife Service's 2011 inventory as a basis. Evaluate the cooling and water quality effects they have on spawning, downstream areas, and surrounding ecosystems. [WRD – USGS — ODFW]
- Categorize groundwater-dependent ecosystems statewide. [public and private sector]
- Complete WRD / USGS Groundwater Studies [See Action 1.B.]

* Build upon the work of ODFW's *Conservation Strategy*, ODF's *Forestry Plan for Oregon*, WRD/USGS Groundwater Studies, and the *Oregon Plan for Salmon and Watersheds.*

Online Resources for More Information

Below are useful resources that contain additional background information on this topic. With the exception of our own publications and sites, the IWRS Project Team makes no endorsement of the information provided below.

FISH HABITAT DISTRIBUTION MAPS
7.5' quad maps showing the distribution of Bull Trout, Coho, Chum, Fall Chinook, Spring Chinook, Summer Steelhead, and Winter Steelhead. http://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistmaps

FISH & WILDLIFE ECONOMIC BENEFITS
This study, highlighted in this bulletin, documents the economic significance that fishing, hunting, wildlife viewing and shellfish harvest had in Oregon and its 36 counties in 2008. http://www.dfw.state.or.us/agency/docs/Report_5_6_09--Final%20(2).pdf

FLOW RESTORATION MAPS
These streamflow restoration priority areas represent watersheds where there is a combination of need and opportunity for flow restoration to support fish recovery. Maps developed cooperatively between the Oregon Water Resources Department and the Oregon Department of Fish and Wildlife, as part of the Oregon Plan for Salmon and Watersheds. http://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=streamflowmaps

GROUNDWATER DEPENDENT ECOSYSTEMS
This 2007 report, developed by The Nature Conservancy, is a methods guide for integrating groundwater needs of ecosystems and species into conservation plans in the Pacific Northwest.
http://www.waconservation.org/data/collins/GroundwaterMethodsGuideTNC_Jan08.pdf

OWRD GROUNDWATER STUDIES & PUBLICATIONS
This site includes several groundwater reports, open file reports, cooperative studies, and other groundwater publications, prepared by the Oregon Water Resources Department. You can also access the U.S. Geological Survey's online publications warehouse from here. http://www.wrd.state.or.us/OWRD/GW/gw_pubs.shtml

DESCHUTES BASIN GROUNDWATER STUDY
The U.S. Geological Survey conducted a study of the groundwater system of the upper Deschutes Basin to develop a quantitative understanding of the regional hydrology and provide tools to allow resource managers and basin residents to evaluate the possible effects of various development scenarios. The study was conducted in cooperation with the Oregon Water Resources Department; the Cities of Bend, Redmond, and Sisters; Deschutes and Jefferson Counties; and the Confederated Tribes of the Warm Springs Reservation of Oregon. The study resulted in five USGS publications as well as several abstracts and other miscellaneous publications.
http://or.water.usgs.gov/projs_dir/deschutes_gw/index.html

CALCULATING CHANNEL MAINTENANCE/ELEVATED INSTREAM FLOWS

This guidance document describes how recommendations are made on water right applications for the use of elevated and peak flows to support out-of-stream uses.
http://www.dfw.state.or.us/fish/water/docs/ODFW_Guidance_on_Allocating_Peak_Flows.pdf

WHITE PAPER: PEAK & ECOLOGICAL FLOWS

In 2009, the Oregon Legislature passed House Bill 3369, which provides grant and loan programs for water conservation and development projects. The bill further allows that proposed storage projects include analyses of peak and ecological flows to standards set by the Oregon Water Resources Department. This white paper provides technical information about peak and ecological flows in terms of 1) defining what they are, 2) describing methods that are commonly used to determine them, and 3) providing recommendations regarding how these methods might be applicable to Oregon. This technical information may be used by policy makers in developing rules, guidance, or other strategies to implement HB 3369. http://www.wrd.state.or.us/OWRD/docs/EFTAG_Final.pdf

ODFW NATIVE FISH STATUS REPORT

This 2005 report provides risk assessments for native salmon and steelhead, most native trout and other selected native fish species. These assessments were developed to help guide priorities for conservation planning.
http://www.dfw.state.or.us/fish/ONFSR/report.asp

OREGON CONSERVATION STRATEGY

Developed in 2006 by the Oregon Department of Fish and Wildlife, the Strategy is a blueprint for conservation of the state's native fish and wildlife and their habitats. It provides information on at-risk species and habitats, identifies key issues, and recommends actions related to both water quality and water quantity.
http://www.dfw.state.or.us/conservationstrategy/

THE OREGON PLAN FOR SALMON AND WATERSHEDS

In 1997 the Oregon Legislature and Governor established the Oregon Plan for Salmon and Watersheds. Motivated by the conviction that Oregon must devise its own response to listings of Coho and other salmon species under the federal Endangered Species Act, the plan quickly evolved into an unprecedented program to preserve and profit from Oregon's natural legacy. http://www.oregon-plan.org/OPSW/

OREGON WATER TRAILS PLAN

This link directs you to the 2005-2014 trails plan. Water trails in Oregon are recreational boating routes on a lake, river, or ocean, which are suitable for canoes, sea kayaks, white water rafts and kayaks, drift boats and rowboats. Like conventional trails, water trails are corridors between specific locations.
http://www.oregon.gov/OPRD/PLANS/docs/trails/Water.pdf

An example of a water trail guidebook, describing Tillamook County estuaries, waterways, and watersheds.
http://www.tbnep.org/images/stories/education/WaterTrail/tillamook_wt.pdf

BULLETIN 4 OF 12 THE WATER & ENERGY NEXUS

The water-energy nexus, an increasingly popular term among policy-makers, refers to the close relationship between water and energy, in terms of producing and using each resource. The Alliance for Water Efficiency and American Council for an Energy Efficient Economy recently published a white paper, identifying ways to gain efficiencies in both areas.

ENERGY NEEDS FOR USING WATER

The United States uses a tremendous amount of energy to deliver water to where it is needed and used. The amount of energy used to pump, treat, and heat water accounts for at least 13 percent of the nation's total electricity use, according to The River Network, a Portland-based organization focused on national watershed protection.

The amount of money Oregonians pay for energy can be partly attributed to water use. According to the Oregon Department of Energy, heating water accounts for 15 to 25 percent of a typical home's energy bill. For a municipality, the energy costs for managing water and wastewater can represent one-third of the total energy bill. The U.S. Environmental Protection Agency estimates that U.S. drinking water and wastewater facilities annually spend about $4 billion on energy costs alone.

WATER NEEDS FOR PRODUCING ENERGY

Just as we need energy in order to use water, we often need water to produce electricity. Water is used to power turbines at hydroelectric facilities. Thermoelectric plants withdraw water and evaporate it to condense steam back to liquid form for pumping purposes. Water is used to cool power-producing equipment in both "open loop" and "closed loop" systems.

In the Pacific Northwest, hydropower is especially important for meeting energy needs. According to the Northwest Power and Conservation Council, forty percent of the electricity used in the Northwest is generated at federal dams in the Columbia River Basin. In an average year, these dams generate 8,664 megawatts of electricity, or enough power for approximately 4,940,000 average homes (at 570 homes per megawatt) or nearly eight cities the size of Seattle.

Renewable Energy Development. Oregon's recent emphasis on renewable energy development yields a series of questions about how the profile of Oregon's water use might change in the future. New sources of power have not been applying for water rights in Oregon for a number of reasons. First, wind generators do not need significant water to run their operations, and only need limited licenses for construction needs. Second, photovoltaic and other high tech manufacturers typically purchase their water from municipalities who are using water via existing water rights.

Adding Hydroelectric Capability. In 2007, the Oregon Legislature modified the state's hydroelectric statutes to expedite the development of hydroelectric generation within existing water transmission systems. That is, if an artificial water delivery system already exists and has certificated water rights, the owner has access to an expedited process, modifying the certificate and allowing the installation of a turbine to capture energy generated in the system. According to the State of Oregon Energy Plan, new

growth in the hydropower sector is most likely to occur in three areas: irrigation systems, pumped storage, and the addition of power facilities on existing dams, especially federal dams.

Encouraging Wave Energy Development. In 2011, the Oregon Legislature included another modification to the state's hydroelectric statutes, allowing wave energy pilot projects to connect to the power grid and recoup their investments. These projects must be less than five megawatts in size and meet other requirements spelled out in statute. This provision will sunset in 2022.

SAVING WATER & ENERGY THROUGH BUILDING CODES

Recognizing the connection between water and energy can lead to savings in both sectors, especially during new building construction or remodeling. Oregon has statewide mandatory building codes in 11 different specialty areas, including plumbing and energy. The state's codes are based on national model codes and are updated on three year cycles. They establish minimum requirements for all commercial and residential construction in the state.

To provide guidance to local jurisdictions on water conservation, the State of Oregon Building Codes Division (BCD) approved Statewide Alternative Methods (SAMs) on rainwater harvesting (applies to both commercial and residential construction as well as potable and non-potable uses) and using graywater for flushing toilets. BCD also published a series of 'Oregon Smart Guides' for consumers, two of which focus on rainwater harvesting and water conservation systems. Online links to these guides are included in this bulletin.

In 2009, Senate Bill 79 directed BCD to develop a 'reach code,' an optional set of construction standards for achieving greater energy efficiency than if a building were constructed under the statewide mandatory codes. Because pumping and treating water and wastewater uses energy, BCD opted to include water conservation measures in the Reach Code. The Oregon Commercial Reach Code (OCRC), scheduled to become effective July 1, 2011, contains provisions from the IAPMO (International Association of Plumbing and Mechanical Officials) Green Plumbing Code that are more stringent than the 2011 Oregon Plumbing Specialty Code. The Oregon Residential Reach Code, scheduled to become effective October 1, 2011, allows site-built composting toilets.

This off-grid solar livestock watering system provides a reliable source of water for livestock and wildlife, while also improving rangeland and streamside health.

Photo/description courtesy of Oregon Dept. of Agriculture

CONDUCTING LONG-TERM WATER & ENERGY PLANNING

Oftentimes, the ability to reduce the demand for energy will also result in savings in the water sector, and vice versa. However, it is also true that achieving greater efficiencies in one area—for example moving from flood irrigation to drip irrigation or other techniques—simultaneously increases the demand in the other area. In this example, more efficient water techniques drive up energy use because of the need to pressurize water delivery systems. Likewise, while re-using water may decrease the volume of water diverted, it may then drive up energy costs related to water quality treatment.

To date, the connection between the use of water and its relationship to energy has largely been unaddressed in water policy, studies, or planning exercises in Oregon. With the Integrated Water Resources Strategy and new efforts to develop a 10-year Energy Plan, Oregon policy-makers have a good opportunity to better connect these two industries and design a system where both resources are managed in a sustainable way.

NOTE: See 2011 Discussion Draft for latest version of Recommended Actions

Draft Recommended Actions

The following *draft* recommended actions are aimed at improving our understanding of the water and energy nexus. These actions reflect themes and ideas heard from Oregonians during the 2010 Open House events, stakeholder workshops, Policy Advisory Group meetings, and online surveys. Each numbered action has a series of bulleted items below it, meant to give an idea or example of how such an action could be implemented.

You may also see these symbols following a recommended action:

- = Key, high priority, concept
- = Ongoing need for applied research
- = Legislation or rule-making likely required

[ ] = Contains more information, such as identifying lead or coordinating agencies or cross-referencing to other actions.

Your feedback on these actions, the bulleted items, and the related symbols is very important to us. Please send any comments or questions directly to the IWRS Project Team at waterstrategy@wrd.state.or.us by Wednesday, August 31, 2011.

ACTION 4.A. ANALYZE THE EFFECTS ON WATER DEMAND FROM ENERGY DEVELOPMENT POLICIES

- A variety of policy drivers, including the Renewable Portfolio Standard, encourage the development of renewable energy sources in Oregon. Compare the effect these energy development policies have on water demand. [Universities]

ACTION 4.B. TAKE ADVANTAGE OF WATER INFRASTRUCTURE TO DEVELOP HYDROELECTRIC POWER

- Encourage the addition of power generation facilities to already-existing infrastructure (dams, pipes, canals, wells). This includes encouraging water right holders with certificated water rights to add hydroelectric capacity onto existing, durable, infrastructure. [State – Federal – Local]
- Engage with Bonneville Power Administration to gain access to unallocated water in the Columbia River when high flow events have exceeded spill maximums. [State – Federal – Local]

ACTION 4.C. INCREASE ENERGY EFFICIENCY AND RENEWABLE POWER PRODUCTION AT WATER AND WASTEWATER TREATMENT FACILITIES

- Encourage greater energy efficiencies and water efficient management practices at water and wastewater facilities, providing targeted training on Energy Management Best Practices to operators and supervisors. [State – Local]
- Promote Installation of biogas, solar, wind, and hydropower projects at water and wastewater facilities to offset power demands and utility costs on site. [State – Local]
- Promote development of "green" infrastructure facilities, to alleviate water and power loads at wastewater treatment facilities. Examples include natural wastewater and stormwater treatment systems, constructed wetlands, and habitat restoration. [State – Local]
- Set energy targets for water and wastewater treatment facilities. Start by developing a baseline of total energy use by water and wastewater utilities, which would include water transmission and treatment; treated water distribution; and wastewater collection, treatment, and disposal energies (not just energy use at the plant level).* [ODOE – Universities]

ACTION 4.D. PROMOTE STRATEGIES THAT CONSERVE BOTH ENERGY AND WATER

- Partner with Oregon's 10-Year Energy Plan to promote these strategies.
- Continue to implement and evaluate building codes that improve water and energy efficiency. In Oregon, these are the Statewide Mandatory Building Codes, the 2011 REACH Code, and the Statewide Alternate Method to Oregon building codes. * [DCBS – Local]
- Partner with water users to find and promote combinations of on-site water savings and energy production that can result in overall conservation savings. [State – Federal –- Universities]
- Design energy efficiency programs that capture and publicly report water savings data, along with energy savings data. [Oregon Department of Energy — Energy Trust of Oregon— Bonneville Power Administration — Oregon Department of Agriculture — Infrastructure Finance Authority]

* These items are drawn from "Addressing the Energy-Water Nexus: A Blueprint for Action and Policy Agenda," Alliance for Water Efficiency and American Council for an Energy Efficient Economy, May 2011.

Online Resources for More Information

Below are useful resources that contain additional background information on this topic. With the exception of our own publications and sites, the IWRS Project Team makes no endorsement of the information provided below.

STATE OF OREGON ENERGY PLAN (2011-2013)
This Energy Plan, developed by the Oregon Department of Energy, outlines the history of Oregon's energy efforts, the basics of Oregon's energy supply and consumption, issues facing the State, and possible future investments.
http://www.oregon.gov/ENERGY/docs/reports/legislature/2011/energy_plan_2011-13.pdf?ga=t

WHITE PAPER: ENERGY & WATER NEXUS
This May 2011 paper, put together by the Alliance for Water Efficiency and the American Council for an Energy-Efficient Economy serves as a blueprint for action and policy agenda for addressing the Water-Energy Nexus
http://www.aceee.org/white-paper/addressing-the-energy-water-nexus

"THE ENERGY-WATER COLLISION"
The Union of Concerned Scientists put together a short publication, outlining 10 facts that summarize the water impacts of our energy choices, and ways to address them.
http://www.ucsusa.org/assets/documents/clean_energy/10-Things.pdf

THE RIVER NETWORK'S WATER & ENERGY SUMMARY
This website provides an overview of the water and energy nexus, plus various reports and publications related to rivers, energy and the climate. The Portland-based River Network also offers helpful tips to save water and energy.
http://www.rivernetwork.org/water-energy-nexus

REPORT: ENERGY AND OREGON AGRICULTURE
Oregon farmers and ranchers have made many energy efficiency improvements, and some have even installed renewable energy projects. However, many opportunities remain. A report released in April 2011 from the Oregon Department of Agriculture describes the types of projects that farmers and ranchers have installed, identifies existing resources to help farmers and ranchers complete these projects, and suggests strategies to promote greater energy efficiency and renewable energy adoption in agriculture.
http://www.oregon.gov/ODA/docs/pdf/ag_energy_report.pdf

REPORT TO CONGRESS: ENERGY DEMANDS ON WATER RESOURCES
The 2006 report by the U.S. Department of Energy presents background information on the connections between energy and water, indentifies concerns regarding water demands of energy production, and discusses science and technologies to address water use and management in the context of energy production and use.
http://www.sandia.gov/energy-water/docs/121-RptToCongress-EWwEIAcomments-FINAL.pdf

"SAVING WATER, ENERGY & FISH – FOR URBAN AND RURAL OREGONIANS"
A 2005 publication developed in partnership with the Oregon Plan for Salmon and Watersheds, USDA-NRCS, the Oregon Water Resources Department, and Oregon Department of Energy, offers several dozen tips for saving both energy and water in and around the home, and on the farm or ranch. It contains contact information for various state and federal agencies, and public utilities.
http://www.oregon.gov/OWRD/PUBS/docs/reports/saving_water_energy_fish.pdf

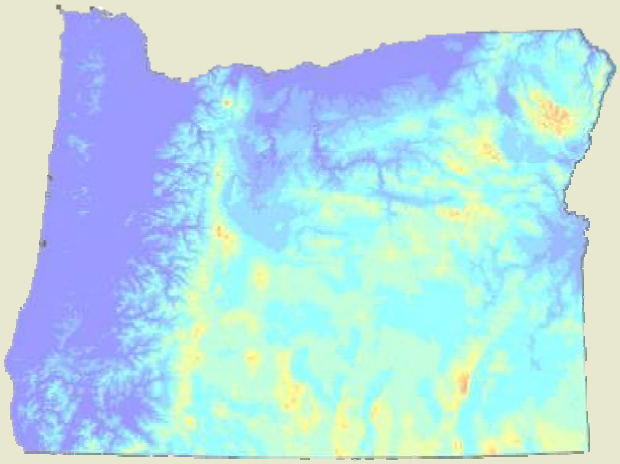
GUIDE: THE NAVIGATOR
Developed by the Farmers Conservation Alliance, this "Rural Guide to Saving Money by Saving Resources" identifies incentive programs offered by state and federal government agencies that help improve energy efficiency, transition to renewable energy, and conserve water. http://www.fcasolutions.org/TheNavigator

BULLETIN 5 OF 12 CLIMATE CHANGE

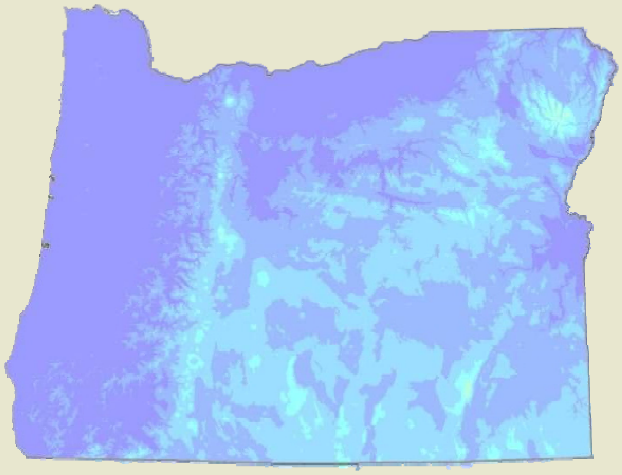
The consensus among climate scientists is that climate shift is occurring and that significant impact to the environment will be felt in this century. The annual average temperature over the Northwestern United States (Oregon, Washington, Idaho and western Montana) is projected to increase 3 to 10 degrees Fahrenheit during this century. Another critical impact will be the changes in precipitation patterns in the western United States.

Oregon and all the Northwest is highly dependent on temperature-sensitive springtime snowpack to meet growing and often competing water demands. Higher temperatures are causing more winter precipitation to fall as rain rather than snow and are contributing to earlier snowmelt. Further declines in snowpack are projected, reducing the amount of water available during the growing season. The amounts of stream flow reduction, for a given amount of warming in winter or spring, are highly variable from one part of the state to another.

The figures below show the percentage of precipitation that falls as rain in two scenarios, conditions today and conditions with a rise in temperature. If Oregon's mean annual temperature increases 3 degrees, the percentage of precipitation that falls as snow is visibly less.



Yellow and orange hues represent areas where a large percentage of precipitation falls as snow.



Snow areas largely disappear with a slight rise in temperature.

The Integrated Water Resources Strategy must provide recommendations regarding the continuous monitoring of climate change effects on Oregon's water supply and describe recommended actions to address climate change. Fortunately, there are many institutions at the local, state, and federal level that are conducting climate change research identifying and assessing risks and actions specific to the Pacific Northwest. Many of Oregon's drainage basins, such as the Willamette, have been the focus of latest research efforts.

The Oregon Department of Land Conservation and Development recently led efforts, with several state agencies participating, in developing a *Climate Change Adaptation Framework*. This Framework represents a broad-scale qualitative assessment of risks to people, infrastructure, communities and

natural resources that are expected to result from the effects of variable and changing climate conditions. The Framework provides initial recommendations for preparing for such risks, including planned and needed actions by state agencies. The Framework describes eleven likely changes in climate conditions in Oregon in the next three to five decades.

LIKELY CHANGES IN CLIMATE CONDITIONS:

1. Increase in average annual air temperature and likelihood of extreme heat events
2. Changes in hydrology and water supply; reduced snowpack and water availability in some basins; changes in water quality and timing of water availability.
3. Increase in wildfire frequency and intensity.
4. Increase in ocean temperatures with potential for changes in ocean chemistry and increased ocean acidification.
5. Increased incidence of drought.
6. Increased coastal erosion and risk of inundation from increasing sea levels and increasing wave heights and storm surges.
7. Changes in abundance and geographical distributions of plant species and habitats for aquatic and terrestrial wildlife.
8. Increase in diseases, invasive species and insect, animal and plant pests.
9. Loss of wetland ecosystems and services.
10. Increased incidence and magnitude of damaging floods and frequency of extreme precipitation events.
11. Increased incidence of landslides.

- *From the Climate Change Adaptation Framework*

Many of the risks identified (see left panel), affect water resources. For instance, Risk 5, an "increased incidence of drought" is likely to occur. Longer and drier growing seasons and drought will result in an increased demand on groundwater resources and increased consumption of water for irrigation, which will have potential consequences for natural systems. Droughts also have negative effects on wetlands, stream systems, and aquatic habitats. Droughts can cause significant economic damage, for example, the agriculture industry may see reduced yields and quality in some crops. Droughts can increase irrigation-related water consumption, and thus increase irrigation costs. Drought conditions can also have a significant effect on the supply of drinking water.

The change in timing and availability of water as a result of climate change may affect whether or not water users are able to utilize their water rights for the amount allowed. Less water may mean that junior users are more frequently regulated to meet the water needs of senior water right holders. Water rights that protect water instream for a certain amount, time of year, and location may no longer be adequate due to precipitation changes and decreased snowpack. An increase in regulation to meet senior rights, protect instream needs, and water quality could result. Water managers and users will need to look for ways to conserve water, reduce demand, and consider alternatives or new ways to meet needs in a changing climate.

Draft Recommended Actions

The following *draft* recommended actions are aimed at improving our understanding and addressing climate change. Many recommendations in this section were drawn from three sources released in 2010: The Oregon Climate Assessment Report, the Oregon Climate Change Adaptation Framework, and the Roadmap to 2020.

These actions also reflect themes and ideas heard from Oregonians during the 2010 Open House events, stakeholder workshops, Policy Advisory Group meetings, and online surveys. Each numbered action has a series of bulleted items below it, meant to give an idea or example of how such an action could be implemented.

You may also see these symbols following a recommended action:

= Key, high priority, concept
= Ongoing need for applied research
= Legislation or rule-making likely required

[ ] = Contains more information, such as identifying lead or coordinating agencies or cross-referencing to other actions.

Your feedback on these actions, the bulleted items, and the related symbols is very important to us. Please send any comments or questions directly to the IWRS Project Team at waterstrategy@wrd.state.or.us by Wednesday, August 31, 2011.

ACTION 5.A. SUPPORT CONTINUED CLIMATE CHANGE RESEARCH EFFORTS

The state of Oregon should continue to collaborate with existing organizations, institutions, and researchers to improve climate change data and tools. [Federal – State — Local—Tribes]

- Continue and improve long-term monitoring of surface and groundwater resources (See Action 1.B).
- Improve real-time forecasting of water delivery, basin yields, monthly streamflow, flood frequency projections, and drought frequency projections.
- Downscale climate data (work largely residing with Oregon's Climate Change Research Institute). Finer resolution will enable agencies to prepare to respond to climate changes on a more local scale.
- Collaborate with the Oregon Climate Change Research Institute and Pacific Northwest Climate Decision Support Consortium on basin-specific studies.

ACTION 5.B. DEVELOP CLIMATE CHANGE SCENARIOS/MODELS

- Climate Ready Water Utilities (CRWU). Support and promote the U.S. Environmental Protection Agency's CRWU program, a resource for water providers to develop and implement long-range plans that account for climate change impacts. See http://water.epa.gov/infrastructure/watersecurity/climate/index.cfm.
- Analyze crops needs and water rights. Determine the likely evolution of crops under various climate change scenarios in Oregon. Determine changes in growing seasons and water needs, by updating Oregon's 1999 *Crop Water-Use and Irrigation Requirements* report (See http://extension.oregonstate.edu/catalog/pdf/em/em8530.pdf). Compare how those results do or do not match with existing water rights and junior water users. [ODA – OUS - WRD]
- Develop basin-specific scenarios, illustrating the impact of climate change on future water use and water availability. Show how climate change could affect the ability to access water when it's needed, and sketch out alternatives.

ACTION 5.C. ASSIST WITH CLIMATE CHANGE ADAPTATION STRATEGIES

- Help restore and protect wetlands, uplands, forests, and riparian zones to increase the capacity for natural water storage.
- Integrate water resource and land management in a way that helps Oregon prepare for natural disturbances, particularly sea-level rise, storm surges, flooding, landslides, wildland fires, etc. Include sensitivity analyses and risk-based planning in city and county comprehensive plans for consideration in state and local permitting processes. Partner with emergency preparedness community and potential funders, including public health and safety interests. [State – Federal - Local]
- Provide assistance to water users to increase storage capacity, water conservation, reuse, and efficiency.

Online Resources for More Information

Below are useful resources that contain additional background information on this topic. With the exception of our own publications and sites, the IWRS Project Team makes no endorsement of the information provided below.

THE CLIMATE LEADERSHIP INITIATIVE

The Climate Leadership Initiative (CLI) is a social science-based global climate change research and technical assistance collaborative between The Resource Innovation Group and the Institute for a Sustainable Environment at the University of Oregon. For the past four years, the Climate Leadership Initiative has been implementing a series of Climate Future Forums and Watershed Resilience Trainings across Oregon's river basins. CLI recently completed an 18-month project with over 200 regional and local experts and stakeholders that focuses on building climate resiliency in the Lower Willamette Region. http://www.theresourceinnovationgroup.org/climate-leadership-initiative/

OREGON CLIMATE CHANGE RESEARCH INSTITUTE

The Oregon Climate Change Research Institute (OCCRI) is a network of over 100 researchers across the Oregon University System. Established in 2007 by the Oregon State Legislature, OCCRI serves as a clearinghouse of climate change information. OCCRI recently completed the *Oregon Climate Assessment Report* (accessible at

http://occri.net/ocar). The report identifies future regional climate changes in Oregon and serves as a resource for decision-makers, stakeholders, researchers, and the public. OCCRI's homepage: http://occri.net/

ROADMAP TO 2020

In 2010 the Oregon Global Warming Commission began a "*Roadmap to 2020*" Project that will offer recommendations for how Oregon can meet its 2020 greenhouse gas reduction goal ("10% below 1990 levels"), get a head start toward its 2050 goal ("at least 75% below 1990 levels"), and build a prosperous, clean-energy-based 21st century state economy. http://www.keeporegoncool.org/content/roadmap-2020

PNW CLIMATE DECISION SUPPORT CONSORTIUM

Led by Oregon State University, the PNW Climate Decision Support Consortium is one of 11 Regional Integrated Sciences and Assessments (RISA) research teams in the United States. The Consortium provides information and tools for making decisions about landscape and watershed management in a changing climate. http://pnwclimate.org/

U.S. FOREST SERVICE – CLIMATE CHANGE RESOURCE CENTER

The Climate Change Resource Center (CCRC) is a reference web site for resource managers and decision makers who need information and tools to address climate change in planning and project implementation. http://www.fs.fed.us/ccrc/. Recently, the Forest Service prepared a general technical report that provides actions for adapting to climate change by improving watershed resilience. http://www.fs.fed.us/pnw/pubs/pnw_gtr812.pdf

BULLETIN 6 OF 12 THE WATER AND LAND USE NEXUS

Oregon's statewide land-use planning program was designed to foster livable and sustainable development; to protect farms, forest lands and other natural resources; to conserve coastal and ocean resources; and to improve the well-being and prosperity of Oregon's citizens, businesses, and communities. Originating in 1973 under Senate Bill 100, the program has positioned Oregon as a nationally recognized leader in the arena of land conservation and development.

Under the program, all cities and counties develop comprehensive plans to address land use problems and concerns. These plans must conform to 19 statewide planning goals that deal with land use, development, housing, transportation, and conservation of natural resources. The Land Conservation and Development Commission will "acknowledge" a local government's comprehensive plan when it complies with the 19 statewide planning goals.

Photo credit: Oregon State University

Many of these planning goals relate to protecting and maintaining water resources, both quantity and quality. For example, Goal 5 requires protecting state-designated areas with known water supply or water quality issues, along with protecting wetlands and significant riparian corridors. Another goal requires many communities to address their drinking water, wastewater disposal and treatment, and stormwater management needs. There are also goals that can indirectly affect water resources, such as development restrictions on forests lands and agricultural lands.

CHANGING LAND USES

Almost half of Oregon is classified as forestland. Sixty percent of Oregon's forestland is managed by the federal government—approximately one quarter of Oregon's total land base. Oregon's forests are a source of high quality drinking water and directly support ecosystem health. The quality of this source water is among the best in the nation. Forests in Oregon today, however, are at risk of being fragmented, converted to other land uses, and encroached upon by development. According to the 2000 *State of the Environment Report,* approximately 80 percent of the once abundant riparian, bottomland forest in the Willamette Valley has been converted to agricultural and urban land uses. Oregon is seeing a significant shift in land uses on private forest land toward more developed uses. The U.S. Forest Service and the Oregon Department of Forestry recently released a study that found 586,000 acres in Oregon changed from forest, agricultural and range uses to low-density residential or urban uses between 1974-2009. Statewide, the largest periodic change in area of land in a forest, range, or farm use on private land was the loss of 141,000 acres from intensive agriculture use between 1974 and 1984. Of this loss, 100,000 acres shifted to low-density residential use.

According to the Oregon Department of Agriculture, roughly 17.1 million acres, or 28 percent of Oregon's land mass, are in agricultural production. The most highly productive farmland in Oregon is also where most Oregonians live —the Willamette Valley.

The Oregon Department of State Lands recently completed a study (link below) with the U.S. Fish & Wildlife Service on wetland and land use change in the Willamette Valley. From 1994 to 2005, the Willamette Valley continued to experience wetland losses. In 2005, the Willamette Valley contained an estimated 311,473 acres of wetlands, which represented 9.7% of the total land area. Between 1994 and 2005, the Valley experienced an estimated net loss of 3,960 acres of wetlands, an average loss of 357 acres per year.

Photo Credit: Oregon State Archives, Gary Halverson

STATE AND LOCAL COORDINATION

Creating and implementing comprehensive plans that reflect and balance the statewide planning goals, the vision of citizens, and the interests of local, state, federal and tribal governments involves considerable coordination. Oregon's land-use planning statutes require state agencies to comply with statewide planning goals and to be compatible with local comprehensive land-use plans when taking actions affecting land-use. More than twenty years ago, several state agencies developed State Agency Coordination (SAC) Programs to ensure compliance and compatibility with local plans. The Water Resources Department, for example, coordinates with each local government on agency actions that involve applications for water use permits, transfers, water exchanges, instream water rights, reservations for economic development, statewide policy formation, and more.

Coordination on land use matters also occurs between local governments, such as a city, and the providers of public services in the area – a water provider, for example. Land use Goal 11 and its administrative rules require cities with a population greater than 2,500 to prepare public facilities plans addressing drinking water, wastewater disposal and treatment, and stormwater management needs. These plans focus on the costs and timing of infrastructure needs and coordination among providers within the jurisdiction.

Wetland Issues on Industrial Land

The Cascades West Economic Development District recognized that economic growth of its region was directly related to its inventory of available industrial lands; however, most of the region's vacant industrially zoned lands contain wetlands. Cascades West partnered with local and state governments to explore the ways that wetlands affect industrial location decisions. Currently, CWEDD is working on a Regional Industrial Lands/Wetlands Mitigation Project, which includes developing one of Oregon's first regional analyses of industrial land use requirements. The outcome is expected to help local governments look at local and regional solutions, such as identifying non-wetland areas for future industrial development, establishing a regional wetlands mitigation bank or other mechanisms that address wetland areas on industrial lands.

INFORMATION NEEDS

In land-use planning, the emphasis is on *land* management. Considering the need to comply with 19 land use goals, the information needed and used to develop land use plans covers a wide spectrum. For example, ODF stream classification maps, ODFW fish presence surveys, the National Wetland Inventory, and FEMA floodplain maps are used to develop local riparian corridor and wetland protections. Some local governments use Drinking Water Source Area maps and Source Water Assessment Reports (when available) to voluntarily initiate a process to protect drinking water sources. Population and employment forecasts are of interest to municipalities when estimating demand for residential, industrial and other sectors.

There are areas, however, where information is lacking and potential improvements could be made to connect land use planning and water resources planning. Of chief concern:

- Local land-use decision makers need more information about groundwater availability at specific locations, as well as the long-term ability of local aquifers to yield water, to inform decisions regarding appropriate locations for development, particularly in rural areas. Available groundwater

information tends to be either too broad (based on regional studies) or too narrow (based on specific project sites).

- Local land-use decision makers need better information about the cumulative impacts of development on water quantity and quality.

- Although some public drinking water systems have had their water source areas mapped, others have not. Therefore, land uses that could pose a risk to the quality of the system's supply cannot be easily identified.

- The carrying capacity of land to absorb sewage through on-site disposal systems over the long term is not well understood for many areas.

- The number and location of historic exempt use wells (those wells that are exempt from applying for a water right permit, as defined in Oregon Revised Statutes 537.545), and average water use by exempt use wells.

- Underground Injection Control (UIC) Systems. Injection Systems are any manufactured design, structure or activity that injects flow below the subsurface of the ground. Common uses include stormwater discharge (from roads, roofs, and parking lots), remediation (cleanup sites), geothermal projects (open or closed loop), industrial process waste, and domestic waste (large onsite). Many entities and businesses use Injection Systems, including local governments, hospitals, parks, stores and malls, casinos, industrial operations, and even homeowner associations. The UIC program is a federal program, managed in Oregon by DEQ, and the intent is to manage stormwater and other wastewater to comply with water quality laws. However, there are strict requirements for the protection of underground aquifers, which are categorized in Oregon as drinking water sources. A requirement for a 500 foot setback (separation) from any drinking water well poses problems, because information about already existing UICs is difficult to find. As a result, new owners of drinking water wells unknowingly find themselves placing wells in conflict with Injection Systems, sometimes placing UIC owners out of compliance with state and federal regulations.

Draft Recommended Actions

The following *draft* recommended actions are aimed at improving our understanding of the water and land use nexus. These actions reflect themes and ideas heard from Oregonians during the 2010 Open House events, stakeholder workshops, Policy Advisory Group meetings, and online surveys. Each numbered action has a series of bulleted items below it, meant to give an idea or example of how such an action could be implemented.

You may also see these symbols following a recommended action:

= Key, high priority, concept
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Your feedback on these actions, the bulleted items, and the related symbols is very important to us. Please send any comments or questions directly to the IWRS Project Team at waterstrategy@wrd.state.or.us by Wednesday, August 31, 2011.

ACTION 6.A. ENSURE THAT LOCAL GOVERNMENTS HAVE ACCESS TO DATA NEEDED FOR DECISION-MAKING

- Develop and share information regarding the location and available quantity and quality of water resources, particularly groundwater. Provide this information to land-use planners. Fund the collection and dissemination of such data. [State – Federal – Local—Tribes]

ACTION 6.B. DEVELOP LAND-USE SCENARIOS / MODELS

- Sourcewater Protection Scenarios. Identify land critical to the long-term management of Oregon's drinking water resources. Develop rules associated with land development that could impinge on the ability of that land to protect sourcewater.
- Identify the potential effect of stricter requirements for land practices to protect water resources (protecting wetlands, forestlands, floodplains, etc.,) on the available stock of developable land.
- Identify water-related ecosystem services; determine the economic benefits and market value of these services. [See Action 11.D].
- Conduct studies to determine the number and location of historic exempt use wells and average water usage per well. Use this information to help inform local land-use decisions [see Action 2.B].

ACTION 6.C. FULLY INTEGRATE WATER INFORMATION INTO LAND-USE PLANNING (AND VICE VERSA)

- Help local governments integrate information about water availability into land-use decisions and plans, including Capital Improvement Plans, Water Management and Conservation Plans, and other local water provider plans that may help inform land-use decisions. [WRD – Local]
- Recognize the role of forest land in protecting watersheds and drinking water supplies; strengthen the limits on forest land conversion in Statewide Planning Goal 4. [DLCD]
- Help local governments integrate water quality information into land-use decisions. More specifically, emphasize Oregon's Statewide Planning Goal 5 to protect public drinking water sources, wetland, and riparian corridors, by completing land-use planning at the local level. [DLCD-OHA-DEQ-DSL]
- Develop rules to implement Statewide Planning Goal 6. Although Goal 6 directs local governments to consider the effects of land-use on water quality, it does not contain details about how to address water quality concerns when making land-use decisions. Build a coalition of non-governmental organizations, agencies, water providers and others to serve as a rule-making advisory group. [DLCD - DEQ]
- Ensure that State Agency Coordination Agreements with the Department of Land Conservation Development are up-to-date.
- Improve location information of Underground Injection Control Systems (UICs) to prevent conflicts with future well development. Improve existing UICs to protect groundwater quality. [DEQ-WRD]

Online Resources for More Information

Below are useful resources that contain additional background information on this topic. With the exception of our own publications and sites, the IWRS Project Team makes no endorsement of the information provided below.

REPORT: INTEGRATING WATER AND LAND USE PLANNING
The University of Montana recently released a policy report titled "Bridging the Governance Gap: Strategies to Integrate Water and Land Use Planning," which offers a few key policy options to encourage better overall integration of water & land use planning. http://cnrep.org/documents/montana_policy_reports/26910-Public-Policy-Water-Land-Use-Report-2011.pdf

REPORT: LAND USE CHANGE: FOREST, FARMS & PEOPLE
A January 2011 report, prepared by the Oregon Department of Forestry and the USDA Forest Service describes land use change on non-federal land in Oregon during the time period 1974-2009. This report will be updated in 2014 and every 5 years thereafter. http://www.oregon.gov/ODF/STATE_FORESTS/FRP/docs/ForestFarmsPeople2009.pdf

REPORT: LAND USE CHANGE: WILLAMETTE VALLEY WETLANDS
The US Fish and Wildlife Service and the Oregon Department of State Lands released a report in December 2010, documenting wetland and land use change in the Willamette Valley from 1994 to 2005.
http://www.oregonstatelands.us/DSL/PERMITS/docs/land_use_chamge_1994-2005.pdf

2000 STATE OF THE ENVIRONMENT REPORT (FRESHWATER WETLANDS)
This chapter of the report focuses on the current status and health of Oregon's freshwater wetlands. Prepared by Janet C. Morlan, Oregon Department of State Lands. http://www.oregon.gov/DSL/WETLAND/docs/soer_ch34.pdf

LAND USE COORDINATION AGREEMENTS
The coordination agreements are housed online via the Department of Land Conservation and Development.
http://www.lcd.state.or.us/LCD/about_us.shtml

OREGON'S LAND USE PLANNING PROGRAM
View a timeline, beginning in 1899, of land use planning milestones in Oregon.
http://www.oregon.gov/LCD/history.shtml

OREGON'S 19 STATEWIDE PLANNING GOALS
Since 1973, Oregon has maintained a strong statewide program for land use planning. The foundation of that program is a set of 19 Statewide Planning Goals. The goals express the state's policies on land use and related topics, such as citizen involvement, housing, and natural resources. http://www.oregon.gov/LCD/goals.shtml

UNDERGROUND INJECTION CONTROL (UIC) SYSTEMS
A 2009 presentation by the Oregon Department of Environmental Quality on the Underground Injection Control Program. http://conferences.wsu.edu/conferences/waterland/proceedings/24_Presentation_Priest.pdf

DEQ'S WILLAMETTE RIVER BASIN ASSESSMENT
A 2009 assessment by the Oregon Department of Environmental Quality that looks at watershed health problems and potential solutions in the Willamette River Basin. http://www.deq.state.or.us/lab/wqm/assessment.htm

NOTE: See 2011 Discussion Draft
for latest version of Recommended Actions

BULLETIN 7 OF 12 WATER-RELATED INFRASTRUCTURE

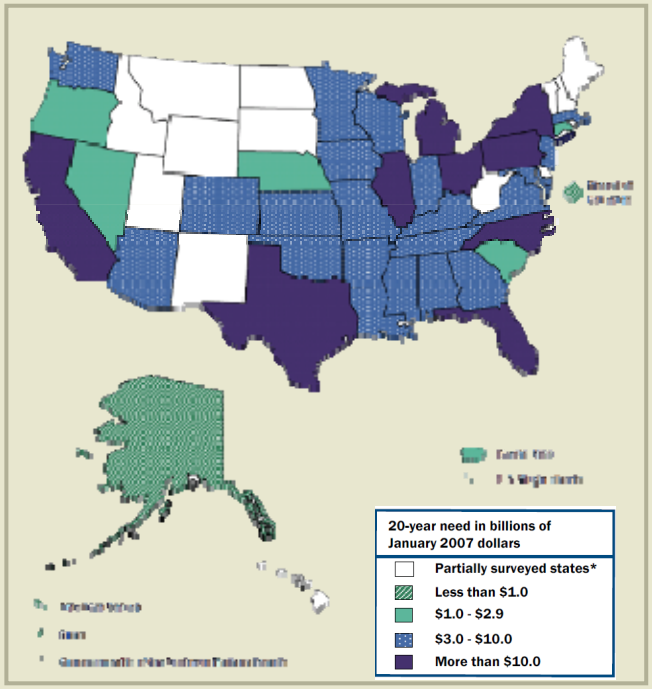
Communities are facing increasing challenges when it comes to maintaining water and wastewater infrastructure. Capital costs are soaring related to construction, operations, and maintenance. Treatment technologies that are in place today may not meet future compliance requirements related to emerging contaminants. Hiring and retaining full-time personnel who are well trained in these issues is an expensive proposition as well.

WATER AND WASTEWATER UTILITY SYSTEMS

The approach in the utility industry is to encourage an "asset management" approach, upgrading and replacing infrastructure when it no longer serves its purpose. According to the U.S. Government Accountability Office (GAO) 2004 report to the U.S. Senate on water infrastructure and asset management, "asset management is a systematic approach to managing capital assets in order to minimize costs over the useful life of the assets while maintaining adequate service to customers."

The GAO report further notes that "collecting, sharing, and analyzing data on capital assets has allowed utilities to make more informed decisions about how best to manage the assets," particularly when it comes to rehabilitating or replacing aging assets.

The U.S. Environmental Protection Agency's (EPA) Sustainable Infrastructure Initiative includes asset management among its examples of best management practices. In EPA's 2009 *Drinking Water Infrastructure Needs Report* (based on 2007 data), the state of Oregon reported a total need related to water infrastructure financing of $3 billion. This compares to an overall national need of $325 billion, for water transmission, sourcewater protection, treatment, and storage needs. This dollar figure places Oregon at the lower end of the "need" scale, particularly compared to East Coast States (see map). This may be in part because Oregon's infrastructure is newer by comparison, and because Oregon has fewer, less dense population centers.

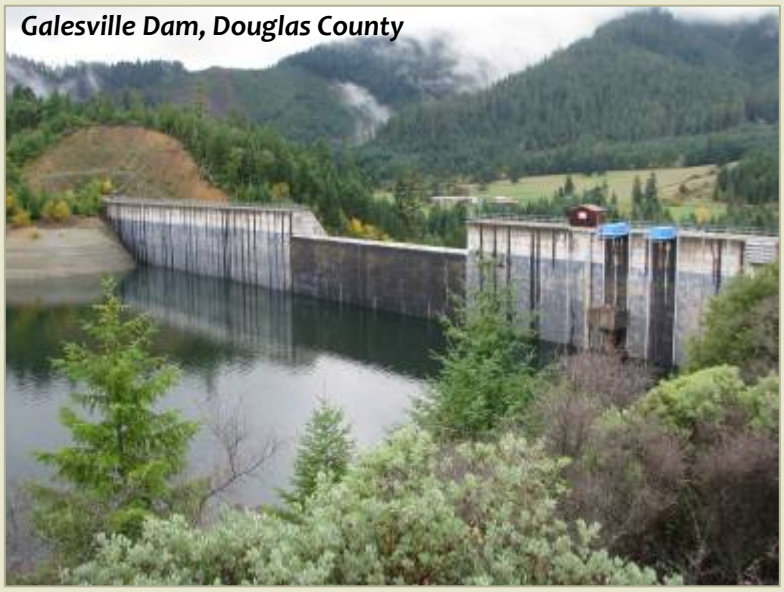


Source: U.S. Environmental Protection Agency

Oregon's Infrastructure Finance Authority (IFA), created in 2009, has as one of its goals to "assist communities to build infrastructure capacity to address public health safety and compliance issues as well as support their ability to attract, retain and expand businesses." The IFA has resources available to help communities finance their water and wastewater systems, through: community development block grants, the Safe Drinking Water Revolving Loan Fund, the Special Public Works Fund, and Water/Wastewater Financing.

INFRASTRUCTURE FOR DAMS

In recent years, other states have suffered significant property and environmental damage and loss of life from dam failures. As structures age and additional seismic information becomes available, proper construction and maintenance becomes even more critical.


Galesville Dam, Douglas County

The Oregon Water Resources Department's Dam Safety program has the responsibility to review and approve the design/specifications of new water storage structures and existing structures undergoing major repair. The program includes inspections on existing hydraulic structures that could pose a threat to life and property. The program coordinator provides engineering expertise, conducts staff training, makes dam inspections, and coordinates routine inspections performed by field staff.

In cooperation with the National Performance of Dams Program (NPDP), Oregon's Dam Safety Program keeps a current inventory of dams that meet both NPDP and Oregon criteria. Dams that are ten feet or greater in height and impound 9.2 acre-feet (3,000,000 gallons) or more are subject to the requirements of the Dam Safety Program. Approximately 1,300 dams are within Oregon's dam safety jurisdiction. Of these, the program goal is to visit 300 dam sites annually, including approximately 115 dams considered to be located where consequences of failure would result in loss of life and severe property damage.

Draft Recommended Actions

The following *draft* recommended actions are aimed at addressing Oregon's water-related infrastructure needs. These actions reflect themes and ideas heard from Oregonians during the 2010 Open House events, stakeholder workshops, Policy Advisory Group meetings, and online surveys. Each numbered action has a series of bulleted items below it, meant to give an idea or example of how such an action could be implemented.

You may also see these symbols following a recommended action:

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ACTION 7.A. ENCOURAGE REGIONAL (SUB-BASIN) APPROACHES TO WATER AND WASTEWATER SYSTEMS

- Evaluate land-use goals, regulatory and funding programs, to identify and remove barriers that prevent the development of regional water and wastewater systems. Regional systems could include physical consolidation, or shared contracts, services, purchases, etc. [State - Local]
- Provide incentives for "regionalizing" water and wastewater infrastructure, by ranking grant and loan applications more favorably when applicants are part of a regional effort. Provide grants and loans specifically for the purpose of regionalizing. [State – Federal]

ACTION 7.B. DEVELOP AND UPGRADE WATER AND WASTEWATER INFRASTRUCTURE

- Use an "asset management" approach to rehabilitate or replace infrastructure that no longer serves it purpose.
- Upgrade facilities to address emerging contaminants and growing populations.
- Ensure that basic maintenance (fixing leaks, replacing wooden pipes, measuring, automating) are counted in the definition of "green infrastructure" so that these projects can continue to compete for grant and loan funding.
- Recapitalize the state's Special Public Works Fund, to continue providing low interest loans and grants to partially offset capital costs.

ACTION 7.C. IMPROVE DAM SAFETY 🕮

- Evaluate the impact of potential dam failure on water supply systems. 🕮
- Encourage efforts to evaluate and retrofit Oregon's dams in anticipation of seismic events, aging, and other conditions. Resources are needed to conduct seismic evaluations that will identify deficient structures.
- Consider anticipated changes in low-frequency flood events, due to climate change predictions, in the design of spillways for existing dams. Resources are needed to conduct a statewide evaluation of problematic structures.
- Encourage the development of emergency action plans (EAP) for all high hazard dams in Oregon. Thirty-two percent of high hazard dams in Oregon have no emergency action plan, which is a predetermined plan of action to be taken, including roles, responsibilities and procedures for surveillance, notification and evacuation, to reduce the potential for loss of life /property damage in an area affected by a failure or mis-operation of a dam. Partner with emergency preparedness community.

Online Resources for More Information

Below are useful resources that contain additional background information on this topic. With the exception of our own publications and sites, the IWRS Project Team makes no endorsement of the information provided below.

GUIDE: DAM SAFETY IN OREGON
The Oregon Water Resources Department developed a general guide to dam safety, providing a history of the dam safety program, its responsibilities and duties, hazard classifications, permitting, inspection and enforcement.
http://www.wrd.state.or.us/OWRD/SW/docs/dam_safety_guide.pdf

INFRASTRUCTURE FINANCING
The Infrastructure Finance Authority, a state agency, helps communities develop infrastructure, public facilities and address their utility and economic development needs through community development programs. Learn more about infrastructure programs, such as community development block grants, the safe drinking water revolving loan fund, special public works funds, and water/wastewater financing. http://www.orinfrastructure.org/

OREGON'S INFRASTRUCTURE REPORT CARD
This report card represents an extensive two-year effort of Oregon's civil engineers in reviewing Oregon's infrastructure, examining bridges, dams, levees, drinking water and wastewater, energy, navigable waterways, rail, roadways, solid waste and transit. http://www.asceor.org/documents/ReportCardHQ200.pdf

SUSTAINABLE WATER INFRASTRUCTURE
The U.S. Environmental Protection Agency has a Sustainable Infrastructure Initiative to guide efforts in changing how the nation views, values, manages, and invests in its water infrastructure. Here you will find more information about better management of water and wastewater utilities, efficient water use, full cost pricing of services, and watershed approaches to protection. http://water.epa.gov/infrastructure/sustain/index.cfm

DRINKING WATER INFRASTRUCTURE NEEDS ASSESSMENT
The U.S. Environmental Protection Agency published a needs survey and assessment in 2009, reporting Oregon's total water infrastructure financing needs at $3 billion.
http://water.epa.gov/infrastructure/drinkingwater/dwns/upload/2009_03_26_needssurvey_2007_report_needssurvey_2007.pdf

GAO REPORT: WATER INFRASTRUCTURE & ASSET MANAGEMENT

March 2004 Report of the U.S. Government Accountability Office to the U.S. Senate on water infrastructure and asset management. http://www.gao.gov/new.items/d04461.pdf

BULLETIN 8 OF 12 EDUCATION AND OUTREACH

Although Oregon is generally regarded as a "wet" state, its communities and watersheds do face water scarcity, depending on location, time of year, source of water, or type of use. Conveying the seriousness of these water conditions, as well as Oregon's options for managing its water resources remains a challenge. To further complicate the matter, looming pressures on our water resources, including population growth and climate change, are not yet "real" in the personal lives of many Oregonians.

COMMUNICATING THE VALUE OF WATER

During a series of open house events and stakeholder workshops during 2010, Oregonians noted that Oregon and its water resources could benefit from a variety of education and outreach efforts. Some stated that the "value of water" and the role that it plays in Oregon's economy, environment, and public health and safety is not well known or appreciated by the general public. Everyone, both young and old, can benefit from a reminder that our human activity and decisions can have a significant effect on both the quantity and quality of our water.

Fortunately, much work already exists related to K-12 "environmental literacy," particularly when it comes to water. In 2009, the Oregon Legislature and Governor launched an *Environmental Literacy Plan,* designed to position Oregon for future federal funding and resources in K-12 environmental education. Released in 2010, the Plan provides a foundation for aligning environmental education with state standards and to involve a network of professional educators. One of the goals of the plan is to prepare students for understanding and addressing the major environmental challenges facing Oregon and the rest of the country, including the relationship of the environment to national security, energy sources, climate change, health risks and natural disasters.

Photo: Oregon Environmental Literacy Plan

High quality, water-related curricula already exists for all ages. Project WET, established in 1984, has a coordinating center at Western Oregon University, and other coordinating centers located nationally and internationally. Project WET's materials provide a good overview of water quality and quantity issues, focusing on topics such as watersheds, wetlands, oceans, sanitation & hygiene, water history, and more. They are used in K-12 programs, and by corporations, governments, and non-governmental organizations all over the world. Materials, available for a fee, have been translated into multiple languages, and come in a variety of formats—activity books, hands-on activities, experiments, etc. The U.S. Environmental Protection Agency also has water quality resources available for educators involved in K-12 classrooms, and many local water utilities, watershed councils, and school districts in Oregon have also developed their own materials.

MAKING INFORMATION AVAILABLE TO THE PUBLIC

During the 2010 Strategy open house events, some participants also noted that members of the public often go on-line, or call public agencies seeking information, but may have great difficulty finding it—either because it does not exist or because it is not well organized. Specific examples include needing information about how to test groundwater wells for contaminants, and what to do if they find any. Other examples involved trying to identify "best management practices," allowing landowners to easily design water conservation, re-use, or other on-site water management programs.

Providing Interactive Information. Third, participants noted that communities, who are searching for efficient ways to protect and develop water resources, need more technical assistance from state agencies, in terms of understanding water quantity and water quality rules and regulations. Questions, such as, "Could we try this…?" or "What if we were to try that…?" often arise, however, finding the answers is sometimes challenging. Technical assistance, in terms of access to staff, should be made available to foster collaboration with communities in these efforts.

Children's Clean Water Festival

The Clean Water Festival is a community-supported event, organized by public, private, and non-profit organizations committed to water and environment education in Oregon. The festival's goal is to teach children that they are capable of having real, long-lasting, positive impacts on water resources, and to equip them with the information they need to do that in a fun and engaging way.

Draft Recommended Actions

The following *draft* recommended actions are aimed at improving Oregon's water-related education and outreach efforts. These actions reflect themes and ideas heard from Oregonians during the 2010 Open House events, stakeholder workshops, Policy Advisory Group meetings, and online surveys. Each numbered action has a series of bulleted items below it, meant to give an idea or example of how such an action could be implemented.

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[ ] = Contains more information, such as identifying lead or coordinating agencies or cross-referencing to other actions.

Your feedback on these actions, the bulleted items, and the related symbols is very important to us. Please send any comments or questions directly to the IWRS Project Team at waterstrategy@wrd.state.or.us by Wednesday, August 31, 2011.

ACTION 8.A. PROVIDE IMPROVED PUBLIC ACCESS TO INFORMATION

- Water Education and Training Program. Develop a statewide "Water Education and Training" Program, providing free, water quality and water quantity information to the public in a variety of formats. Partner with the private sector, OSU extension, universities, tribes, watershed councils, soil and water conservation districts, watershed councils, all levels of government, non-governmental organizations, and industry associations. This would constitute a broader effort, with more real-time data and policy information than K-12 curricula produced at the national level. [State – Local — Tribal — Private Sector Partners]
- On-Line Water Information Center. Under a "Water Education and Training Program," launch an on-line water information center with links to local, state, and federal water resources. Make databases searchable and extractable. Scan and post public documents. Translate "raw data" to "useful information" for the public and for decision-makers. Include information about best management practices, available grants and basic water curricula

(i.e., the water cycle and the importance of conservation), as well as "ongoing research needs," with questions that students in K-12, college, and graduate levels could assist with.

- Marketing the Value of Water. Under a "Water Education and Training Program," reach audiences through public broadcasting, newspapers, advertisements, community meetings, and electronic media. Start with a baseline survey of public knowledge. Use simple terminology. Encourage local journalists to write water articles. Conduct a "Celebrate Oregon's Waters!" campaign. Use the Water Trails Program at Oregon Parks and Recreation Department to increase access to water-related recreational opportunities and promote interest in protection of water resources.
- Focus on issues where individuals can do something to make a difference: pharmaceutical take-back, non-point source pollution prevention, water conservation, etc.
- Provide domestic well and septic system owners with information about testing / monitoring, treating for contamination, technical resources, and funding.

ACTION 8.B. ENCOURAGE THE NEXT GENERATION OF WATER EXPERTS

- Build a corps of experts in engineering, hydrology, hydrogeology, water law, farming and irrigation techniques, and other technical specialties. Smaller communities have a growing need for water and wastewater treatment facility operators, and other expertise.
- Provide technical training to soil and water conservation district staff, watershed councils, public agency employees, irrigation district managers, etc.
- Offer internships, fellowships, and other opportunities for exposure to careers in water.

Online Resources for More Information

Below are useful resources that contain additional background information on this topic. With the exception of our own publications and sites, the IWRS Project Team makes no endorsement of the information provided below.

PAPER: HIGH SCHOOL WATER QUALITY MONITORING
This academic paper traces the modern history of environmental education in the classroom, as first envisioned by legendary educator Bill Stapp. http://homepage.mac.com/vtalsma/papers/Bill_Stapp.html#Water

MAP GALLERY
An outreach piece developed early in the Integrated Water Resources Strategy project, identifying the water quality and water quantity challenges facing the state in different locales, during different seasons, and for different water users. http://www.wrd.state.or.us/OWRD/LAW/docs/IWRS/Map_Booklet.pdf

OREGON'S ENVIRONMENTAL LITERACY PROGRAM
The State of Oregon passed legislation to create an environmental literacy plan (HB2544), designed to ensure that every student in Oregon becomes a lifelong steward of their environment and community. The resulting task force developed a 2010 report as a first step toward implementation.
http://www.ode.state.or.us/gradelevel/hs/oregon-environmental-literacy-plan.pdf

PROJECT WET
Established in 1984, Project WET offers water-related curricula for all ages and audiences. Materials focus on water history, water quality, water sources, Native American waters, and more. http://www.projectwet.org/

U.S. EPA'S TEACHING RESOURCES
K-12 curricula include water quality resources focused on beaches, coral reefs, wetlands, watersheds, and more. This site uses a variety of teaching techniques, including You Tube videos, a partnership with the Girl Scouts of America, and an on-line zip code search. http://www.epa.gov/teachers/water.htm

WATER RIGHTS IN OREGON: AN INTRODUCTION
This publication provides a Water Rights 101, including the basics of Oregon Water Law, obtaining permits, transferring water, conserving water, and finding additional resources to help.
http://www.oregon.gov/OWRD/PUBS/aquabook.shtml

NOTE: See 2011 Discussion Draft
for latest version of Recommended Actions

BULLETIN 9 OF 12 FUNDING FOR OREGON'S WATER

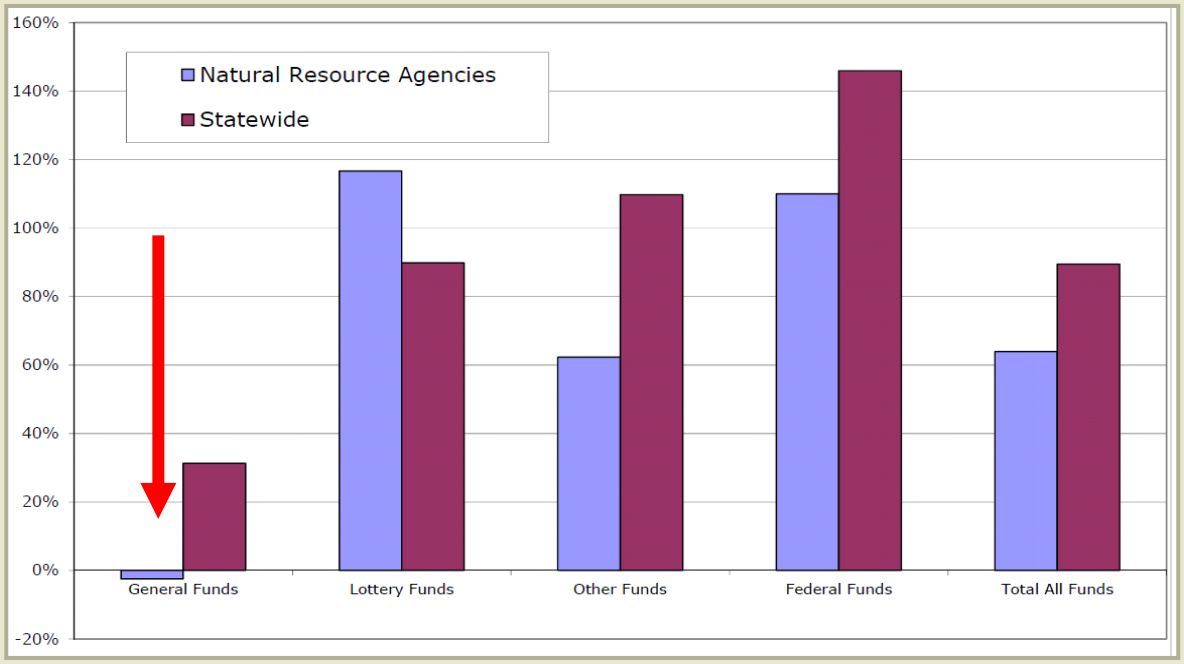
Natural resources are critical to Oregon's economy. Natural resource activities such as agriculture, forestry, fisheries and mining, as well as recreational activities and tourism including fishing, hunting, wildlife viewing, camping and hiking are major economic drivers in Oregon's economy.

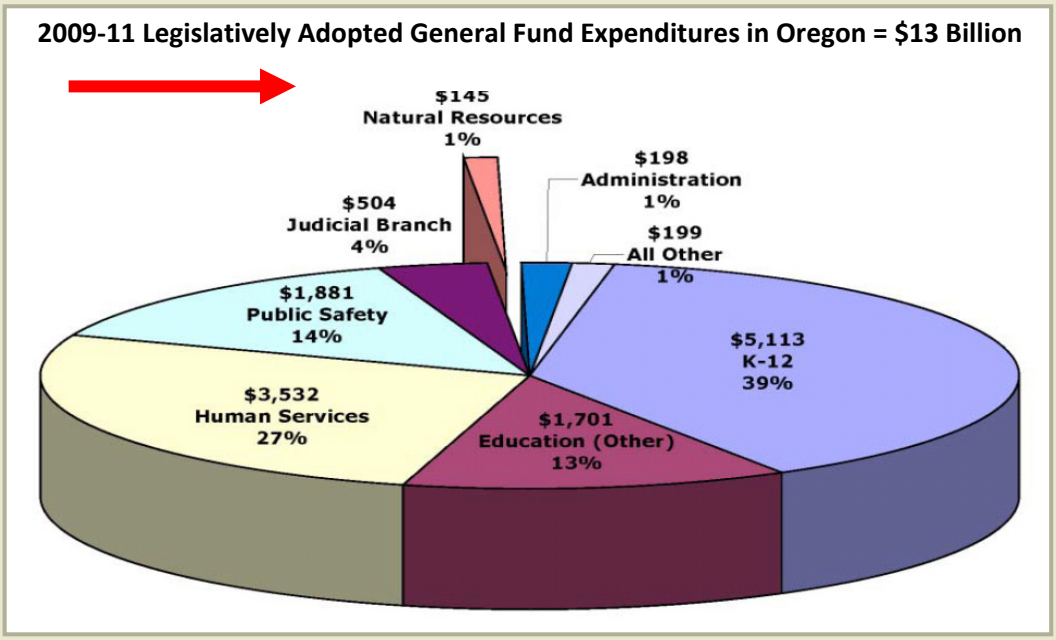
Oregon's natural resources agencies compiled the following facts in 2011:

- The total combined economic activity of Oregon's natural resource industries amounts to more than $55 billion in output – 37% of the state's annual domestic product.
- Approximately 550,000 Oregonians work in natural resource-related fields, or jobs supported by those industries, making up more than one-third of the state's employment.
- For every $1 in general fund invested in natural resource agencies, $376 in economic activity is generated by Oregon's natural resource sector.

Since the 1999-2001 biennium, General Fund investment in all agencies has risen 31.33 percent, while the investment in natural resource agencies has declined 2.52 percent (see bar chart). This investment equates to less than one percent of Oregon's General Fund budget (see pie chart). This declining trend of disinvestment must be reversed, in order to ensure Oregon's natural resource legacy for future generations and to implement our shared vision into the future. In addition, state agencies need the capacity and flexibility to take advantage of cost-share opportunities with the federal government. Oftentimes, dollars removed from state budgets result in dollars lost at the federal level.

Change in Spending from 1999-2011





Funding at the state level is needed to support ongoing data collection and analysis, information technology, and mapping capabilities in order to make water resources decisions. Some agencies only develop data as funding becomes available for a "snapshot" in time. Other funding needs include operational costs and funding reserves to address drought or other emergencies. To help communities progress toward a more "regional" approach to water, the state will also need to dedicate staff and resources to these efforts. Local communities are in various stages of water resource protection and water project development. Insufficient funding is one significant barrier to ongoing work. While existing programs do provide grant funding for planning, feasibility studies, and even implementation, is it still important to continue to capitalizing these funds into the future.

FUNDING MODELS IN OTHER STATES

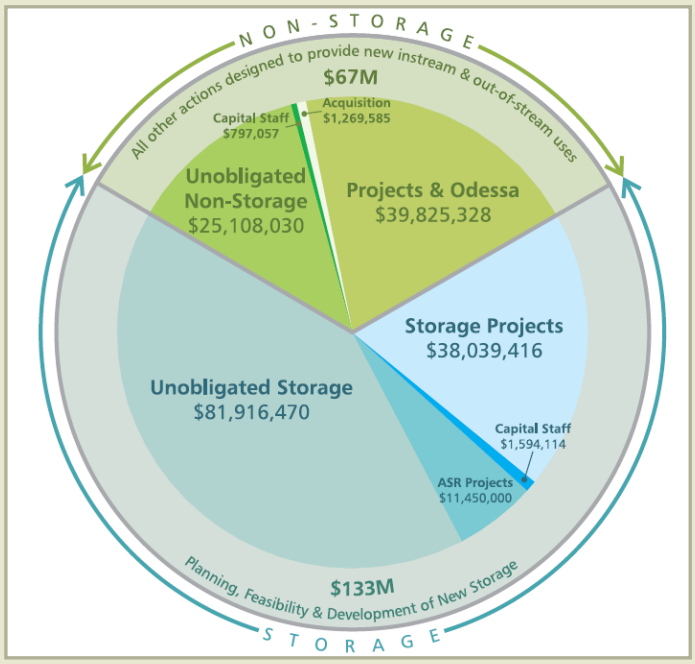
The state of Oregon has looked at water-related funding efforts in other states, many of which have made significant investments.

Funds for Planning

In general, states that are conducting long-term water planning have state agency staff budgeted and assigned to long-term planning as part of their duties. In addition, monies have been made available for a variety of tasks: basin-level planning, construction of water supply projects, and/or consultants to help with these tasks. Florida reports that individual basins have budgets of millions of dollars each for planning. Georgia had a one-time budget in 2009-11 of $36 million to conduct planning across 10 regions. Texas had a $3 million budget in 2009-11 for planning across 16 regions, and Wyoming has about $500,000 per year to conduct planning across seven basins. Oregon's neighbors to the north and south have also made significant investments (see below).

The State of California. California began developing long-term water plans 50 years ago, and is statutorily mandated to update them every five years. Although the state has set aside a budget for these purposes, it has dwindled over time from $4.5 million in 2000 to $2.5 million in 2008, and even less today. About 40 part-time staff members work throughout the state on data collection and water budgets, 15 more located in district offices conducting data processing, and an additional 30 to 40 experts who provide in-kind technical work.

The State of Washington. Washington secured $200 million in general obligation bonds to fund water supply projects in 2006 (see accompanying pie chart). This funding is supposed to be allocated with two-thirds of the money available for appropriation for out-of-stream uses and one-third available to augment instream flows. The 2006 Act (Chap. 90-90 RCW) also directs the Washington Department of Ecology to publish a water supply inventory annually and long-term water supply and demand forecast every five years. Each year, the Washington has used these monies to fund projects consistent with its legislative mandate to "aggressively pursue development of water supplies to benefit both instream and out-of-stream water uses."



Funding Ideas for Day-to-Day Operations

The State of California. California has been working for several years to establish a funding mechanism that relies less on the General Fund in order to pay for its day-to-day operations. In 2003, the California Legislature passed Senate Bill No. 1049, directing the California Water Resources Control Board's Water Rights Division to charge annual user fees to fund its operations. The Water Rights Division regulates water rights through a permit and licensing program. As a result, water permit and license holders were charged a fee of $100 or $0.03 per acre-foot of water, whichever was higher. This fee was designed to cover a budget of approximately $7 million. Although challenged in the courts by water users, the water right fee program was found to be "facially constitutional" by unanimous decision of the California Supreme Court in 2011.

The State of Minnesota. There are approximately $75 million of dedicated water funds available each year under Minnesota's 2008 Land, Water and Legacy constitutional amendment. The amendment increased the general sales and use tax rate by three-eighths of one percentage point (0.375%) to 6.875% and dedicated one-third of the resulting additional proceeds to water quality protection, one-third to the restoration of wetlands and other wildlife habitat, and the remaining third to support parks, arts, and cultural heritage efforts.

Draft Recommended Actions

These *draft* recommended actions are aimed at improving funding for the development and protection of Oregon's water resources. These actions reflect themes and ideas heard from Oregonians during the 2010 Open House events, stakeholder workshops, Policy Advisory Group meetings, and online surveys. Each numbered action has a series of bulleted items below it, meant to give an idea or example of how such an action could be implemented.

You may also see these symbols following a recommended action:

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ACTION 9.A. ESTABLISH A WATER MANAGEMENT FUND FOR THE STATE OF OREGON

- Establish a water management fund with public and private funding sources. Use this to fund state natural resource agencies at a level to ensure state oversight, management, and technical assistance related to water resources. Funding sources could include the General Fund, lottery dollars, federal funds, a water rights management fee, wastewater fee, or other sources.
- Dedicate monies to state water management (including data collection and applied research, operational costs, and funding reserves for drought or other emergencies).

ACTION 9.B. CAPITALIZE FUNDS FOR LOCAL WATER PROJECTS

- Capitalize a number of already-existing water related grant funds ("OWSCI Planning Grants," "SB 1069 Feasibility Study Grants for Water Conservation, Reuse and Storage," "HB 3369 Implementation Grants," and "OWEB Grants") that encourage public benefits.
- Capitalize loan programs that provide low interest loans for water development projects.

ACTION 9.C. COORDINATE STATE AND FEDERAL FUNDING PROGRAMS

- The state and its partners should make investments in water resource planning, data, protection, and restoration using a more strategic and coordinated watershed approach. The Bureau of Reclamation has competitive basin-studies grants available for these activities. [see Action 10.C].
- Show applicants, at-a-glance, various funding programs available for water-related projects.
- Agencies should review the schedules and application criteria for state grants to determine if dates, forms, or criteria could be modified to facilitate a streamlined approach through reduction of duplicative efforts. Communities are spending too much time chasing water and energy-related dollars with slightly different criteria and requirements.

Online Resources for More Information

Below are useful resources that contain additional background information on this topic. With the exception of our own publications and sites, the IWRS Project Team makes no endorsement of the information provided below.

ENERGY TRUST OF OREGON
Energy Trust can reimburse an eligible, approved participant for 50 percent of the costs incurred in hiring a qualified consultant to perform grant-writing services. Feasibility study proposals submitted through Energy Trust's grant writing assistance program that do not receive grants may be considered for Energy Trust study funding assistance.
http://energytrust.org/public-sector/grants-proposals/

INFRASTRUCTURE FINANCE AUTHORITY
The Infrastructure Finance Authority, a state agency, helps communities develop infrastructure, public facilities and address their utility and economic development needs through community development programs. Learn more about infrastructure programs, such as community development block grants, the safe drinking water revolving loan fund, special public works funds, and water/wastewater financing. http://www.orinfrastructure.org/

OREGON DEPT. OF ENERGY: COMMUNITY RENEWABLE ENERGY FEASIBILITY FUND (CREFF) GRANTS
CREFF offers grants of up to $50,000 for feasibility studies for renewable energy, heat, and fuel projects in Oregon. Any entity in Oregon that seeks funding for a feasibility study for a renewable energy project that will benefit Oregon energy consumers and communities is eligible to apply. http://www.oregon.gov/ENERGY/RENEW/CREF.shtml

OREGON DEPT. OF ENVIRONMENTAL QUALITY: CLEAN WATER STATE REVOLVING FUND LOAN PROGRAM
The Oregon Department of Environmental Quality administers Oregon's Clean Water State Revolving Fund (CWSRF) to help public agencies finance water quality improvements. http://www.deq.state.or.us/wq/loans/loans.htm

OREGON WATER RESOURCES DEPARTMENT: WATER CONSERVATION, REUSE, AND STORAGE GRANT PROGRAM
Established by Senate Bill 1069 (2008), this program awarded 22 grants statewide during 2008 and 2009. The program is designed to fund the qualifying costs of planning studies that evaluate the feasibility of developing water conservation, reuse, or storage projects.
http://www.wrd.state.or.us/OWRD/LAW/conservation_reuse_storage_grant.shtml

RURAL COMMUNITY ASSISTANCE CORPORATION LOANS
RCAC, a non-profit organization based in Sacramento, California, provides loans to finance water and waste facility projects. RCAC's loan programs are unique — they provide the early funds small rural communities need to determine feasibility and pay pre-development costs prior to receiving state and federal program funding.
http://www.rcac.org/doc.aspx?126

U.S. ARMY CORPS OF ENGINEERS: THE PLANNING ASSISTANCE TO STATES PROGRAM
This Program authorizes the U.S. Army Corps of Engineers to use its technical expertise in management of water and related land resources to help States address their water resource problems. The U.S. Army Corps of Engineers cooperates with states in the preparation of plans for the development, utilization, and conservation of water and related land resources, with a maximum of $500,000 available annually to any State. A 50 percent cost share is required. https://www.nwp.usace.army.mil/services/home.asp

U.S. BUREAU OF RECLAMATION: SYSTEM OPTIMIZATION REVIEWS & WATERSMART
System Optimization Reviews (SOR) consist of: (1) An assessment of the potential for water management improvements in a river basin, system, or district and (2) A report identifying specific improvements to increase efficiency, including a plan of action for implementing the recommendations. The recommendations can include physical improvements, such as modernizing a water delivery system, changing operations to improve water and energy efficiency, or facilitating water transfers or water marketing.

Applicants who have already completed an SOR may receive additional points during the WaterSMART's Water and Energy Efficiency Grant review process. Through the WaterSMART Grants (formerly Challenge Grants) Reclamation provides 50/50 cost share funding to irrigation and water districts, Tribes, States and other entities with water or power delivery authority. Projects should seek to conserve and use water more efficiently, increase the use of renewable energy, protect endangered species, or facilitate water markets. Projects are selected through a competitive process and the focus is on projects that can be completed within 24 months that will help sustainable water supplies in the western United States. http://www.usbr.gov/WaterSMART/market.html

U.S. DEPARTMENT OF AGRICULTURE: RURAL DEVELOPMENT LOANS
Water and Environmental Programs at USDA provide loans, grants and loan guarantees for drinking water, sanitary sewer, solid waste and storm drainage facilities in rural areas and cities and towns of 10,000 or less. Public bodies, non-profit organizations and recognized Indian tribes may qualify for assistance. WEP also makes grants to nonprofit organizations to provide technical assistance and training to assist rural communities with their water, wastewater, and solid waste problems. http://www.rurdev.usda.gov/UWEP_HomePage.html

U.S. DEPARTMENT OF AGRICULTURE: RURAL ENERGY FOR AMERICA PROGRAM GRANTS (REAP)
The USDA's REAP program provides grants and loans to rural small businesses and agricultural producers for the purchase and installation of renewable power projects. REAP grants typically cover 25 percent of the cost of a renewable power project. REAP gives preference to projects looking for $20,000 or less in assistance, and provide a simplified application process for projects requesting less than $200,000. REAP also offers grants to small businesses and farmers and ranchers to help them pay for the cost of a detailed, professional, independent feasibility study on their prospective renewable energy projects. http://www.rurdev.usda.gov/or/reap.htm

U.S. DEPARTMENT OF AGRICULTURE: VALUE-ADDED PRODUCER GRANTS
The USDA provides funding for feasibility studies that support renewable energy projects at farms, ranches and dairies. VAPGs are designed for rural small businesses and agricultural producers who want to determine if adding a renewable power project to their land makes economic sense.
http://www.rurdev.usda.gov/rbs/coops/applicants.htm

NOTE: See 2011 Discussion Draft
for latest version of Recommended Actions

BULLETIN 10 OF 12 **PLACE-BASED APPROACHES**

This bulletin covers a wide range of "place-based approaches," from a broad look at the international parties involved in the Columbia River Treaty, to a more narrow look at the partners involved in water resources management in a sub-basin, or local community. Although everything we do in the natural resources community has a sense of "place," the concepts in this bulletin focus on three very specific topics: transboundary agreements, regional (sub-basin) approaches to infrastructure, and basin or sub-basin water management plans.

TRANSBOUNDARY AGREEMENTS

The Columbia River Treaty between the United States and Canada was established in 1964, bringing significant flood control and power generation benefits to both countries. The year 2024 marks the end of 60 years of pre-paid flood control space from Canada. In addition, either Canada or the United States can terminate most of the provisions of the Treaty any time on or after Sep. 16, 2024, with a minimum 10 years' written advance notice, making 2014 another important benchmark year for this Treaty. The U.S. Army Corps of Engineers and the Bonneville Power Administration, the agencies responsible for implementing the Treaty for the United States on behalf of the U.S. Entity, are conducting a multi-year effort to study these post-2024 Treaty issues. This effort is called the 2014/2024 Columbia River Treaty Review.

Klamath Basin Restoration Agreement. Representatives of more than 50 organizations, including Federal agencies, Oregon and California, Indian tribes, counties, irrigators and conservation and fishing groups signed the Klamath Basin Restoration Agreeement and Klamath Kydroelectric Settlement Agreeement on February 18, 2010. These agreements set signatories on a path to comprehensive solutions for the Klamath Basin. The Restoration Agreement is intended to: 1) restore and sustain natural fish production and provide for full participation in ocean and river harvest opportunities of fish species throughout the Klamath Basin; 2) establish reliable water and power supplies which sustain agricultural uses, communities, and National Wildlife Refuges; and 3) contribute to the public welfare and the sustainability of all Klamath Basin communities. The Hydroelectric Settlement lays out the process for additional studies, environmental review, and a set of decisions by the Secretary of the Interior regarding the removal of four PacifiCorp dams.

Oregon's Three-Mile Wide Territorial Sea Marked in Blue

Territorial Sea Plan. In the early 1990's, the Oregon State Legislature called for a plan to better manage marine resources within the state's three-mile territorial sea. The resulting Territorial Sea Plan (TSP) focuses on approaches that will best conserve ocean resources for current and future generations. This includes balancing competing uses and prioritizing the protection of renewable marine resources over the development of non-renewable ocean resources. In 2008, the state began work to amend the Plan, in order to guide the siting of

ocean renewable energy facilities. The Department of Land Conservation and Development completed Phase I of this work in November 2009, publishing a new Chapter 5, entitled "Uses of the Territorial Sea for the Development of Renewable Energy Facilities or Other Related Structures, Equipment or Facilities." This document spells out the policies, standards, and procedures that state agencies will use to approve new energy development. Phase II, slated for completion in 2011, will result in maps to guide the location of energy facilities, while protecting areas important to ocean fisheries and important marine habitat.

FUNDING REGIONALIZATION APPROACHES

There are more than 3,500 public water systems in Oregon. Oregon communities, particularly smaller ones, are struggling to adequately fund water and wastewater-related infrastructure. The high capital costs related to infrastructure, the construction, operation, and maintenance cost of facilities, and the salary and training costs of qualified personnel all seem prohibitively expensive to communities with a small ratepayer base. In Oregon, these tend to be rural, coastal, and/or small urban communities. Providing incentives, like funding, to consolidate and regionalize some of these systems could provide significant benefit.

Rural Communities. A 2008 report by the Governor's Office of Rural Policy describes "u*rban-rural"* communities as those who are slowly losing their agricultural base to increased development, which means additional municipal infrastructure demands. There is a struggle by these communities to finance water and wastewater infrastructure and system upgrades. The report describes *"frontier rural"* communities as dependent on agricultural and other natural resources activities to sustain their local economies. Finally, *"isolated rural communities"* are extremely self-reliant and dependent on volunteer services to protect public health and safety.

Typically, rural communities rely on groundwater, either through a small community water system or through individual wells that supply water to a single household. Isolated or individual use of groundwater makes it difficult for homeowners, business, and small water providers to address both water quantity or water quality issues. When the well output drops, most often a back up source of water to supply household needs is not available. Drilling a new well or repairing an existing one to increase supply can be extremely expensive to an individual user.

Coastal Communities. Oregon's coastal communities comprise 186 miles of Pacific Ocean coastline and encompass nearly 60 public beaches**.** Many coastal communities are located in rural or sparsely populated areas. Approximately 210,000 people call the coast "home" full time. Coastal counties include Clatsop, Coos, Curry, Lincoln, Tillamook County, and portions of Douglas and Lane County. The five largest coastal communities are Astoria, Lincoln City, Newport, Coos Bay, and North Bend. Many coastal communities are prime tourist destinations, making their water use highly seasonal.

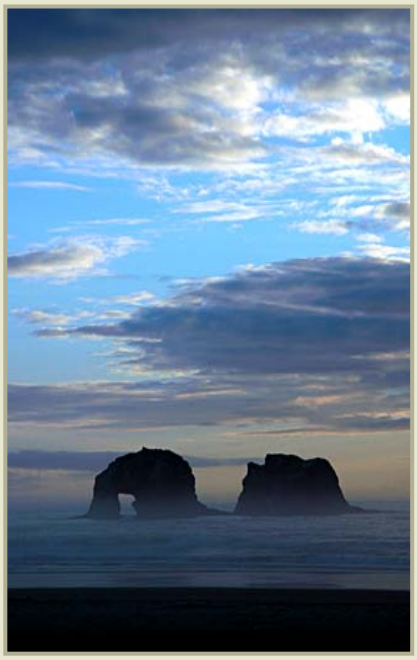

Photo: Gary Halvorson, Oregon State Archives

Coastal water systems rely heavily on surface water, rather than groundwater, due to a lack of groundwater resources. These supplies come from relatively small watersheds, where the streams are short, high gradient, and very seasonal, with low overall yields. To meet drinking water quality standards, communities often rely on treatment plants. Financing upgrades or expansions to water systems is a challenge in many communities. Outdated or undersized treatment facilities, combined with sewer outflows, are considered to be the greatest threat to coastal water quality. In recent decades, increases in population, development, and storm damage have placed a considerable amount of pressure on the ability of Oregon's coastal communities to provide reliable and safe drinking water.

Small Urban Communities. There are 69 cities in Oregon with a population over 2,500 that are not part of a metropolitan area, according to 2009 data. This is about 30 percent of Oregon's cities and 17 percent of the

state's population. Urban communities vary across that state, differing in geographic and social characteristics. Most residents and businesses in these communities have the benefit of water and wastewater disposal service, either from the city or a district. There is a wide range of circumstances, however, related to growth and the jurisdiction's capacity to deal with development from a public facilities standpoint.

The benefits that economies of scale can bring—qualified experts, purchasing power, etc.—are often stymied by high up-front costs, and long-running disputes. In 2009-10, the Federal American Recovery and Reinvestment Act (ARRA) offered funds to Oregon communities, specifically for the purpose of consolidating water and wastewater delivery systems. One community responded, consolidating three manufactured dwelling parks into a nearby city system. Despite very attractive financial terms, other Oregon communities had difficulty overcoming the short-time frame provided for applications, as well as some significant territorial and political barriers, and left ARRA funding on the table. As a result, some communities remain in non-compliance with drinking water standards and will face extraordinary costs to come into compliance.

Basin Planning at the State Level

Many western states have made water planning at the basin level an essential component to further develop and periodically update their state water plans. In Oregon, water resource planning has been implemented on a river basin-by-river basin basis. Since the late 1950's, the state has developed river basin water plans, collectively referred to in statute and rule as "basin programs." These plans have a narrow focus, apportion or classify each basin's water for certain "designated uses" based upon present water supply uses and constraints and future water supply needs. These designated uses included domestic, livestock, municipal, irrigation, power development, industrial, mining, recreation, wildlife, pollution abatement and fish life uses. The Water Resources Department, responsible for developing these basin programs, bases its work around 18 administrative basins.

The Department of Environmental Quality also uses basins for planning purposes, albeit with different boundaries. The Oregon Watershed Enhancement Board works with all 36 watershed councils in the state, and organizes along six regions. The Department of Forestry has three Forest Practice Regions. The Drinking Water Program at Oregon Health Authority has two regions, and the Oregon Business Development Department works along county lines. These boundaries have evolved historically, based on differing mandates, funding sources, federal partners, and local resources and needs.

Although these agencies write distinct and separate workplans, they do comment on each other's workproducts, providing recommendations based on their own local experiences. There may be even more opportunity in the future to integrate these workplans, through shared data, staff or other resources.

WATER RESOURCE PLANNING AT THE BASIN OR SUB-BASIN LEVEL

Water Management and Conservation Planning provides a process through which water users estimate long-range water supply needs, and identify potential sources of supply, including water conservation programs, to meet those needs. The Water Resources Department requires municipal water suppliers to prepare plans as conditions of their water use permits or permit extensions, and the Department coordinates a voluntary program for agricultural users. Likewise, the Department of Environmental Quality has developed water quality action plans for the North Coast, Rogue, and other basins, by facilitating a multi-stakeholder process. Such processes provide a model for bringing municipal, agricultural, industrial and other water users to the table with wastewater and stormwater and other water managers. Water resource planning at the basin or sub-basin level is a recurring theme heard often in the development of the Integrated Water Resources Strategy, and merits more discussion in the coming months.

Draft Recommended Actions

The following *draft* recommended actions are aimed at promoting place-based approaches to improve water management. These actions reflect themes and ideas heard from Oregonians during the 2010 Open House events, stakeholder workshops, Policy Advisory Group meetings, and online surveys. Each numbered action has a series of bulleted items below it, meant to give an idea or example of how such an action could be implemented.

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ACTION 10.A. ENCOURAGE A REGIONAL (SUB-BASIN) APPROACH TO WATER AND WASTEWATER SYSTEMS (SEE ACTION 7.A)

ACTION 10.B. PARTICIPATE IN TRANSBOUNDARY AGREEMENTS

Continue to participate in transboundary efforts related to water management and long-term planning. These include the Columbia River Treaty, the Klamath Basin Restoration Agreement and its related work groups, and Oregon's Territorial Sea Plan.

ACTION 10.C. FACILITATE REGIONAL (SUB-BASIN) WATER RESOURCE PLANNING

This Strategy provides an opportunity to pursue a more integrated approach, when it comes to protecting, sharing, or developing water resources at the basin and sub-basin level. Recognizing the value of both "bottom up" and "top down" approaches, developing water resource plans with local, state, and federal partners at the table will ensure that the best of both processes are utilized. These plans should integrate water quantity, water quality, and ecosystem issues.

- **Ways the State can help:**
  - Provide a framework for local basin planning.
  - Help coordinate each basin or sub-basin that wants to take this approach.
  - Share basin-level data gathered by local, state, and federal partners in an on-line format.
  - Establish incentives, including grants, for communities to conduct this planning at the basin or sub-basin level. (The Bureau of Reclamation also has competitive basin-studies grants available for these types of activities.)
  - Identify permitting, funding, or other management issues that would be ripe for simplifying or streamlining.
  - Conduct a pilot project at the basin-level that clearly identifies a water resource need, and then brings together partners, funding, and technical assistance / programs to address this need.

- **Regions should use the following tools and ideas:**
  - Conduct an assessment, determining whether land-use laws, regulations, or ordinances are getting in the way of regionalization efforts.
  - Determine needed improvements in water-use efficiency, water quality, public health, and ecosystem protections.
  - Use scenario planning as part of the decision-making process.
  - Consider data modeling to facilitate decision-making at the local level.
  - Use adaptive management; re-visit assumptions periodically.
  - Account for economic values and impacts of intact/healthy watersheds. Provide incentives for protection.
  - Identify sources of water (freshwater, recycled water, stormwater, etc.). Conduct assessments, matching reclaimed water quality to end uses (e.g., flushing or irrigating with non-potable water).
  - Identify demands for water.
  - Consider conservation pricing (define and charge "full cost," not flat rates for water).

- Consider water sharing between communities.
- Commit to implementation as part of this process.
- Document and publicize best water management practices in the basin.

- **Regions and localities may want to ask themselves the following questions to jumpstart planning:**
  - Define your water needs and water quality levels of those needs. Whose wastewater could you use?
  - Define your wastewater streams and their water quality levels. To whom could you deliver your wastewater?
  - How many times could you use water before returning it to the environment?
  - Identify the most critical wetlands in your region. Prioritizing their protection creates a market / credits system.
  - What ecosystem services could this community provide? What revenue would such an ecosystem service need to generate in order to help it stay in place?

Online Resources for More Information

Below are useful resources that contain additional background information on this topic. With the exception of our own publications, the IWRS Project Team makes no endorsement of the information provided below.

BASIN PROGRAMS FOR ALLOCATING WATER RESOURCES
The link will take you to a summary of the intent and implementation of the State's Basin Programs (see pages 14-16).
http://www.wrd.state.or.us/OWRD/LAW/docs/IWRS/7_13_Presentation_Materials.pdf

COLUMBIA RIVER TREATY
Below is the official Columbia River Treaty 2014/2024 Review website, hosted by the U.S. Army Corps of Engineers and the Bonneville Power Administration. http://www.crt2014-2024review.gov/

KLAMATH BASIN RESTORATION AGREEMENT
The U.S. Dept. of the Interior has posted a copy of the February 18, 2010 Klamath Basin Restoration Agreement online.
http://www.doi.gov/news/pressreleases/upload/Klamath-Basin-Restoration-Agreement-2-18-10.pdf

OREGON'S TERRITORIAL SEA PLAN
This link will take you to the Oregon Department of Land Conservation and Development webpage, which outlines the state's Territorial Sea Plan. http://www.oregon.gov/LCD/OCMP/Ocean_TSP.shtml

OREGON EXPLORER
Oregon Explorer provides a natural resources digital library by integrating data from state and federal agencies, local governments, university scientists, and citizens. A collaboration between Oregon State University (OSU) Libraries and the OSU Institute for Natural Resources, Oregon Explorer's place-based and topic-based web portals allow anyone with an internet connection to find, download, and work with information about natural resource issues in Oregon. Users can interact with up-to-date scientific information through maps, datasets, images, publications, and user-driven tools, and can create and download maps, charts, and reports. http://www.oregonexplorer.info/

WATER MANAGEMENT AND CONSERVATION PLANNING
This site provides a summary of the water management and conservation planning process that many municipalities conduct as a requirement of a water use permit or permit extension.
http://www.wrd.state.or.us/OWRD/mgmt_muni_wmcp.shtml

Irrigation districts and other agricultural water suppliers can also participate in the Water Resources Departments' planning process. http://www.wrd.state.or.us/OWRD/mgmt_ag_wmcp.shtml

NOTE: See 2011 Discussion Draft
for latest version of Recommended Actions

BULLETIN 11 OF 12

WATER MANAGEMENT

As we plan for Oregon's water future, we will need to develop new and innovative management strategies for meeting the many needs of Oregonians and the natural environment. Effectively managing water resources will rely on coordinated actions by federal, state, and local agencies, Indian tribes, the private sector, and non-governmental organizations.

WATER CONSERVATION

One of the more recognized water management techniques is water conservation. Water conservation is defined in state law as a means of eliminating waste or otherwise improving the efficiency of water use by modifying the technology or method of diverting, transporting, applying or recovering water. This is accomplished by changing management of water use, or by implementing other measures.

Water conservation is a tool that can be implemented in any water use sector. For example, agricultural operations can often convert to a more efficient irrigation system, including weather-based irrigation systems, moisture sensor controls, drip irrigation, lining canals or piping, or variable speed pumping.

This landscape is featured in a Xeriscape™ Guide, developed for residents and businesses of Central and Eastern Oregon by the Central Oregon Cities Organization. The Guide offers maintenance & design tips, as well as plant suggestions, for effective water management within the landscape. A link to the guide is available on the last page of this bulletin.

Oregon residents and businesses alike can conserve water by replacing certain appliances, such as toilets, showers, baths, faucets, dishwashers, and washing machines with more water efficient models. Landscaping techniques, such as maintaining healthy soils, planting drought tolerant or native plants, and watering when temperatures are cooler, are all actions that contribute to water conservation.

To encourage efficient water use, many federal, state and local entities offer technical and financial assistance, incentives, and informational resources. Some municipal water providers offer rebates for the purchase and installation of water efficient appliances; some also provide shower timers, leak detection kits, and water conservation consultations free of charge to customers.

The Oregon Water Resources Department, OSU Extension Service, USDA-Natural Resources & Conservation Service, soil and water conservation districts, and watershed councils conduct a variety of water conservation programs and can offer technical expertise or financial assistance. The Oregon Department of Energy, Energy Trust of Oregon, and the Oregon Watershed Enhancement Board are a few of the entities that provide funding through grant programs, cash incentives, and tax credits.

Although Oregonians are not strangers to water conservation, several issues act as barriers, such as:

- **Energy Costs.** Sometimes, water efficiency-improvement projects can result in an increase in energy consumption and burdensome costs to the user.
- **Forfeiture.** A (mis)perception that conserving water will result in forfeiture of water rights.
- **Funding.** A central place to find funding opportunities by various entities does not exist, making it difficult to coordinate grant awards for projects and meet certain application and reporting deadlines.
- **Information Gaps.** Water users are unaware of several state and federal conservation programs. Some of these tools are only used in a few drainage basins, like the Deschutes, Umatilla, and Rogue Basins.
- **Protecting Water Instream.** Protecting the water that has been conserved through efficiency improvements is a challenge because of a lack of measurement, monitoring, and staff to enforce its protection instream.
- **Reduced Return Flow.** Water conservation may result in reduced return flows on groundwater recharge and streamflows, and have unintended consequences to other water users downstream.

BUILT STORAGE

The history of water storage in Oregon dates back to the 1800s when projects consisted mostly of ponds, or small dams across streambeds. As the state's population grew, so did the scale and purpose of these projects. Before long, developers and governments were building major multi-purpose dams and reservoirs to meet the increasing water demands for power production, flood protection, and out-of-stream needs during the dry summer months.

The value of "multipurpose" storage projects is codified in the state's water storage policy, adopted in 1992 by the Water Resources Commission. This policy identifies storage as an integral part of Oregon's strategy to enhance public and private benefits from use of the state's water resources. The policy also acknowledges that both structural and non-structural methods should be used in Oregon to store water. In 1993, the Oregon Legislature adopted a policy on storage facilities, declaring it a high priority to develop environmentally acceptable and financially feasible multipurpose storage projects and to enhance watershed storage capacity through natural processes using nonstructural means (ORS 536.238).

Today, there is a mix of both publicly and privately owned storage reservoirs in use throughout Oregon. The largest of these are federal storage projects. There are four federal reservoir systems that are not fully allocated, representing key points of discussion between the state and two federal agencies, the U.S. Army Corps of Engineers and the U.S. Bureau of Reclamation. In the Rogue Basin and Umatilla Basin, federally owned reservoirs contain available water supplies with solid processes already in place to negotiate contracts for stored water. However, in the Crooked River Basin and the Willamette Basin, it is difficult to secure contracts for unallocated water.

BELOW GROUND STORAGE - AQUIFER STORAGE AND RECOVERY (ASR) AND ARTIFICIAL RECHARGE (AR)

The authorization process for ASR and AR projects occurs through the Oregon Water Resources Department (OWRD), which coordinates input from the Oregon Department of Environmental Quality, Oregon Health Authority and Oregon Department of Fish and Wildlife.

In 2008, the Water Resources Department evaluated 54 groundwater aquifers within Oregon, creating a rating system of "geologic suitability for underground storage." This is an original methodology that helps assess the suitability of potential locations for underground storage. The Department evaluated aquifers in terms of their

physical ability to store water. The analysis does not include an economic or environmental feasibility analysis, only a hydrogeologic evaluation of how these areas accept and retain water.

Currently, about a dozen aquifer storage and recovery projects and about half a dozen artificial recharge projects are authorized throughout Oregon. Many underground storage projects are located in the northern portion of Oregon, where geology, water availability and cost-benefit circumstances create a favorable environment for this water management tool. New projects are added each year as interest in this technology grows. Both municipal and agricultural water users are engaged in underground storage pilot projects and long-term projects as part of their water supply portfolios.

Aquifer Storage and Recovery is defined as "the storage of water from a separate source that meets drinking water standards in a suitable aquifer for later recovery and not having as one of its primary purposes the restoration of the aquifer."

Artificial Recharge is defined as "the intentional addition of water diverted from another source to a groundwater reservoir." Groundwater reservoir is a designated body of standing or moving groundwater having exterior boundaries, which may be ascertained or reasonably inferred.

WATER RE-USE

The State of Oregon encourages the use of recycled water (or "water re-use"), so long as the use protects public health and the environment. Interest in using recycled water use continues to grow in Oregon. Several agencies, including the Oregon Health Authority, Department of Environmental Quality, Oregon Water Resources Department, and the Oregon Department of Consumer and Business Services (Building Codes Division), are very involved in water re-use programs. The Oregon Association of Clean Water Agencies has identified recycled water use as a top priority for its members. As of 2009, Oregon had permitted more than 120 water re-use projects.

The use of recycled water provides many benefits to both water quantity and quality. Water quality can be improved by the reduction of discharged treated effluent (e.g., a municipality "recycles" its wastewater by using it to irrigate a park). Recycled water can provide a benefit to water quantity by reducing the demand on drinking water sources (e.g., using non-potable water – instead of drinking water – for toilet flushing). In general, recycled water places fewer demands on freshwater, leaving more water instream or for other uses.

A MARKET FOR ECOSYSTEM SERVICES

The concept of ecosystem services and markets has been recognized in Oregon law since the 2007 Oregon Legislature approved House Bill 2293. The bill states that these benefits come from the conservation, management and restoration of ecosystems generally, and that the protection of these environmental benefits in Oregon is intended to result in improvements to the region's economy, the rural resource base, and our quality of life.

Senate Bill 513, signed into law in 2009, defines an ecosystem services market as "a system in which providers of ecosystem services can access financing to protect, restore and maintain ecological values, including the full spectrum of regulatory, quasi-regulatory and voluntary markets." It establishes a policy in Oregon to "support the maintenance, enhancement and restoration of ecosystem services throughout Oregon, focusing on the protection of land, water, air, soil and native flora and fauna" and explicitly encourages state agencies to "adopt and incorporate adaptive management mechanisms in their programs in order to support the maintenance, restoration, and enhancement of ecosystem services."

A number of public entities and non-profit organizations are already participating in ecosystem markets. Clean Water Services, a public utility serving Washington County, was awarded Oregon's first Integrated Watershed-based Stormwater and Wastewater NPDES Permit that allows for the trading of temperature credits within the Tualatin River Basin. This permit allows Clean Water Services to address wastewater discharge temperature requirements by trading point to nonpoint temperature credits within the watershed. By trading temperature credits, Clean Water Services is avoiding costly refrigeration units at its wastewater treatment facilities. As a

result, Clean Water Services is able to invest a portion of its cost savings in strategies that lead to greater ecological benefits in the watershed while meeting regulatory requirements.

Two programs that encourage ecosystem markets are the state's Wetland Mitigation Program and the Deschutes Basin Mitigation Program. The Oregon Department of State Lands operates the state's Wetland Mitigation Program, where wetland mitigation banks have been established to sell credits to offset unavoidable impacts to natural wetlands impaired by a development project. In parts of the Deschutes Basin, water users can obtain new groundwater permits while still maintaining scenic waterway and instream water right flows by obtaining credits from mitigation banks. Sources of mitigation include instream transfers and instream leases. The Oregon Water Resources Department oversees the Deschutes Basin Mitigation Program.

The Bonneville Environmental Foundation, a nonprofit organization, has established Water Restoration Certificates™ that allow businesses to offset their water consumption by returning an amount of water equal to what they have used back to the environment. The Willamette Partnership has been working on developing a functioning ecosystem service market for Oregon and the greater Pacific Northwest by creating a package of protocols, tools, and resources that allow buyers and sellers to trade in multiple types of ecosystem credits. The Willamette Partnership's Counting on the Environment Project is piloting this system from September 2009 through September 2011.

Examples of Ecosystem Services:

- Climate regulation by trees taking in carbon dioxide,
- Water supply and storage to protect against droughts and floods (e.g., wetlands and floodplains recharging groundwater supplies,
- Maintenance of water quality and availability (e.g., shading of streams by trees, wetlands and riparian areas filtering stormwater),
- Maintenance of soil fertility,
- Habitat that supports fish and wildlife populations,
- Pollination, and
- Recreational, nature-based opportunities for humans.

- from the 2011 Oregon Sustainability Report (link below)

Draft Recommended Actions

The following *draft* recommended actions are aimed at improving water management through conservation, storage, re-use, and ecosystem markets. These actions reflect themes and ideas heard from Oregonians during the 2010 Open House events, stakeholder workshops, Policy Advisory Group meetings, and online surveys. Each numbered action has a series of bulleted items below it, meant to give an idea or example of how such an action could be implemented.

You may also see these symbols following a recommended action:

= Key, high priority, concept
= Ongoing need for applied research
= Legislation or rule-making likely required

[ ] = Contains more information, such as identifying lead or coordinating agencies or cross-referencing to other actions.

Your feedback on these actions, the bulleted items, and the related symbols is very important to us. Please send any comments or questions directly to the IWRS Project Team at waterstrategy@wrd.state.or.us by Wednesday, August 31, 2011.

ACTION 11.A. INCREASE WATER CONSERVATION & WATER EFFICIENCY

- Establish and fund an on-line water conservation clearinghouse that documents water conservation's "best practices." The clearinghouse could include information on existing state and federal conservation programs, grant opportunities, and technical resources. State agencies with water conservation programs include OWRD, ODA, Building Codes' REACH Program, and ODOE. Provide "on-the-ground" resources to help explain the benefits of water conservation, best management practices, and to provide technical information, and resources.

- Focus on agricultural water efficiency. Using more than 80 percent of Oregon's diverted water, agriculture is the largest consumer of water in Oregon, and increased efforts in water efficiency in this sector could result in significant water savings statewide. To begin the process, encourage more irrigators to develop Agricultural Water Management and Conservation Plans. Provide grant funding for this purpose through the Water Resources Dept. and make use of Oregon Dept. of Energy tax incentive credits or Oregon Dept. of Agriculture efficiency grants.
- Engage industrial users to see if any regulations currently stand in the way of greater water efficiency.
- Publicize and clarify existing conservation programs at the local, state, and federal level, particularly the Allocation of Conserved Water Program and the Water Management and Conservation Planning Program to help with water conservation. Look for ways to expand the Conserved Water Program to reward more types of efficiency efforts. Partner with the Alliance for Water Efficiency and EPA's Water Sense Program.

ACTION 11.B. INCREASE BUILT STORAGE

- Encourage greater use of Artificial Recharge as a water treatment technique to help meet water quality standards for Aquifer Storage and Recovery, as demonstrated in the Umatilla Basin Aquifer Restoration Project. Areas of the State designated as 'groundwater limited' or 'critical groundwater areas' may be especially good candidates. Continue to make planning and feasibility study grants available for these projects. [WRD – DEQ – local communities]
- Allocate and reauthorize existing storage projects [Corps – BOR – WRD – local communities]. Seek funding to facilitate work between the state and federal agencies for allocating water stored behind federal dams, particularly in the Willamette, Columbia, and Crooked River Basins. Authorize a full range of beneficial uses, including anadromous fish and water quality needs, municipal, agricultural and industrial water supply, and recreation.
- Expand or improve existing storage projects [DSL – WRD – Federal Agencies – local communities]. Increase the storage capacity of existing storage projects, using various methods including raising dam height or dredging.
- Develop new off-channel storage sites [ODFW – DEQ – WRD – Federal Agencies - local communities—Tribes]. This alternative includes storing water behind dams constructed on side channels to the main stem and tributaries where no known fish habitat may exist. Natural runoff can be stored during the wet season and released during the dry season.

ACTION 11.C. ENCOURAGE ADDITIONAL WATER RE-USE

- Ensure that Oregon has the right policies and regulations in place to facilitate municipal and industrial water re-use.
- Conduct a statewide assessment of the potential for water re-use to fulfill current and future water supply needs, matching the water quality of reclaimed water to appropriate end uses.
- Maintain funding for the Water Resources Department's grant program for conducting water conservation, re-use, and storage feasibility studies.
- Encourage and incentivize increased industrial water re-use.

ACTION 11.D. ASSIST IN THE DEVELOPMENT OF ECOSYSTEM CREDITS AND MARKETS

Value and invest in ecosystem markets. Build upon Senate Bill 513 (2009), which sets the stage for ecosystem markets in Oregon. Specifically identify ecosystem service benefits or credits that can be sold outside of Oregon.

Online Resources for More Information

Below are useful resources that contain additional background information on this topic. With the exception of our own publications and sites, the IWRS Project Team makes no endorsement of the information provided below.

ALLOCATION OF CONSERVED WATER PROGRAM

The Water Resources Departments' Allocation of Conserved Water Program allows a water right holder who conserves water to use portion of the conserved water on additional lands, while a portion of the conserved water is permanently protected instream, providing benefits to both the water user and instream needs. This program, which serves as both a streamflow restoration and water supply tool, offers an incentive for water conservation.
http://www.wrd.state.or.us/OWRD/mgmt_conserved_water.shtml

OREGON SMART GUIDES

A new series of informational booklets offered by DCBS' Building Codes Division provides both consumers and contractors information about best practices in building methods and technology. They are a source for the public to get a basic

understanding of these building techniques. Two guides currently offered focus on rainwater harvesting and water conservation systems. http://www.bcd.oregon.gov/pdf/smart_guides.html

CENTRAL & EASTERN OREGON XERISCAPE™ GUIDE
http://www.ci.bend.or.us/online_forms_and_documents/docs/XeriGuide_2005.pdf

FACT SHEET: AQUIFER STORAGE AND RECOVERY AND ARTIFICIAL GROUNDWATER RECHARGE
This fact sheet by the Oregon Department of Environmental Quality provides a description of the purpose and definition of Aquifer Storage and Recovery (ASR) and Artificial Recharge (AR) projects. Also includes a summary of how ASR/AR projects are regulated in Oregon. http://www.deq.state.or.us/wq/pubs/factsheets/groundwater/AquiferStorageRecovery.pdf

REPORT: ECOSYSTEM SERVICES & MARKETS: SENATE BILL 513
The Oregon Sustainability Board prepared a report for the 2011 Legislative Assembly, offering recommendations for creating a successful ecosystem marketplace. Ten policy proposals were developed to promote development and implementation of an integrated ecosystem marketplace in Oregon.
http://www.oregon.gov/OWEB/docs/SB513_final_report.pdf

ECOSYSTEM MARKETING: ORGANIZATIONS AND PROGRAMS
The Ecosystem Services section of this bulletin references several organizations and programs that are currently working on ecosystem markets. More information can be found at the following sites.
- Clean Water Services: http://www.cleanwaterservices.org/AboutUs/OurStory/CleanWaterInstitute.aspx
- Oregon's Wetland Mitigation Program: http://www.oregon.gov/DSL/PERMITS/wetland_mitigation.shtml
- Oregon's Deschutes Mitigation Program: http://www.oregon.gov/OWRD/Deschutes_five_year_eval.shtml
- Bonneville Environmental Foundation's Water Restoration Certificates™ http://www.b-e-f.org/business/products/wrcs/
- The Willamette Partnership, Counting on the Environment Program: http://willamettepartnership.org/ongoing-projects-and-activities/nrcs-conservation-innovations-grant-1

FACT SHEET: WATER RE-USE
This DEQ fact sheet provides information on the types of treated wastewater and its application to various uses. This fact sheet also provides a few examples of where recycled water is used in Oregon.
http://www.deq.state.or.us/wq/pubs/factsheets/reuse/waterreuse.pdf

THE NAVIGATOR
Developed by the Farmers Conservation Alliance, this "Rural Guide to Saving Money by Saving Resources" identifies incentive programs offered by state and federal government agencies that help improve energy efficiency, transition to renewable energy, and conserve water. http://www.fcasolutions.org/TheNavigator

POTENTIAL WATER STORAGE OPPORTUNITIES
The Water Resources Department developed an inventory of potential storage sites in Oregon, including both above and below-ground sites. No attempt was made during this stage to assess the ecological or economic feasibility of these projects. The Department is providing this information to communities to avoid "reinventing the wheel," in terms of site investigation. This information will also help the state identify and prioritize possible future projects.
http://www.wrd.state.or.us/OWRD/LAW/owsci_info.shtml#Potential_Water_Storage_Sites

WILLAMETTE BASIN RESERVOIR STUDY
This 2001 study was conducted jointly by the Oregon Water Resources Department and U.S. Army Corps of Engineers.
http://www.wrd.state.or.us/OWRD/docs/Res_Study_Update_2001.pdf

WILLAMETTE BASIN RESERVOIRS
An overview of the U.S. Army Corps of Engineers dams and reservoirs on Willamette River tributaries.
http://www.wrd.state.or.us/OWRD/docs/WillametteReservoirs.pdf

BULLETIN 12 OF 12 ECOSYSTEM HEALTH & PUBLIC HEALTH NEEDS

The protection and restoration of Oregon's water resources helps to ensure long-term ecosystem health and public health. These in turn enhance Oregon's economy and quality of life. A recent report from the University of Oregon Ecosystem Workforce Program shows that every $1 million of public investment in clean water and habitat restoration creates about 15-24 total jobs.

STATUS OF OREGON'S ECOSYSTEM HEALTH

A healthy, resilient watershed is able to resist or quickly recover from disturbance events, such as floods, fires, or insect outbreaks. Maintaining healthy, forested watersheds is especially important considering the ecosystem services that are provided from healthy soils, clean air, and high quality water to supporting both native aquatic and riparian species.

Riparian areas. A riparian area is the zone of transition from an aquatic ecosystem to a terrestrial ecosystem. These areas are located adjacent to lakes, reservoirs, estuaries, wet meadows, and streams. According to Oregon's *2000 State of the Environment Report*, riparian areas represent a conservative estimate of 15 percent of the total area in the state. Riparian areas help to improve water quality, reduce flooding impacts, augment dry season streamflow, and provide habitat for fish and wildlife. The plants that grow in riparian areas are essential for preventing erosion, filtering pollutants and sediment, and providing shade to keep streams cool. Many human activities take place in riparian areas, in both rural and urban landscapes, such as timber harvesting, reforestation, road construction, herbicide and pesticide use, grazing, mining, agriculture, and residential development. If poorly planned or implemented, these activities can have detrimental effects on the function of these areas.

Wetlands and Floodplains. Through their ability to hold and slowly release water, filter and biologically process nutrients, and provide shade and habitat, Oregon's upland wet meadows, riparian wetlands, and floodplain habitats have a direct impact on water storage, flow, water quality, habitat quality and water temperature. This can also be said of the relationship between floodplain habitat health and a stream's resilience to damage caused by floods. The habitat structures and functions of wetlands, wet meadow storage, floodplain absorption, vegetated shade, filtration, and peak flows directly influences the quality and quantity of water, and vice versa. Oregon has lost an estimated 38 percent of its original wetlands. In the Willamette Valley, a recent study shows an average loss of wetlands at the rate of 357 acres per year, between 1994 and 2005 .

Photo: US Bureau of Land Management

Netarts Bay in Tillamook County, Oregon. Netarts Bay Estuary is monitored on a monthly basis for water quality.

This image is a composite of lidar-derived shaded relief and orthorectified aerial photography. Lidar imagery by Daniel Coe, Oregon Department of Geology and Mineral Industries, from the agency's 2010 Lidar Landscape series.

Estuaries. An estuary is a highly productive environment located at the lower end of a river where the current meets the sea tide. Estuaries provide important habitat for many fish and wildlife species for rearing, nesting, foraging, and as a migration route. Numerous species can be found in Oregon's estuaries, such as salmon, herring, flounder, crabs, oysters, clams, birds, ducks, geese, shorebirds, and harbor seals. There are 22 major estuaries in Oregon; the Columbia River estuary at Astoria is the largest in area at approximately 80,811 acres, although most estuaries along the coast are relatively small. Most estuaries typically experience high winter floods that deposit large volumes of sediment, coupled with low summer streamflow and high seawater content. Others, such Sand Lake and Netarts Bay estuaries receive very little freshwater. Low summer flows from rivers can cause the mouth of an estuary to be completely closed off. The different estuary types mean that habitats vary and include marshes, eelgrass beds, mudflats and tidal channels. Some of the issues affecting the health of Oregon's estuaries include increased sedimentation and nutrient load, introduced nuisance species, development, recreational pressures, and low freshwater inflows.

Forested Areas. Forests are closely tied with water quantity and water quality. Forest soils are important for the regulation of surface and groundwater flow. Forest soils act as natural source of stored water. The interaction of soil and water plays an important role in the health of the streams and rivers flowing through Oregon's forests. Oregon is comprised of more than 60 million acres of land. Nearly 50 percent of the state, or 30 million acres, is classified as forestland.

More than half of Oregon's population depends on water supplies that originate on or are protected in part by forestlands. The quality of this source water is among the best in the nation. At the statewide scale, data collected between 1998 and 2007 indicate more than 90 percent of the sampled sites on forestlands showed an Oregon Water Quality Index in good or excellent condition, and the remaining sites in fair or lower condition. A 2009 report prepared by the Department of Environmental Quality shows water quality highest for generally higher elevation, higher stream gradient federal sites, with 97 percent in good or better conditions.

Oregon's forest values are at risk, as the density of homes in private forests has doubled in the last decade; forests are being fragmented, converted to other uses, and encroached upon by development. The rising expense of owning forestland, and the land's growing value as real estate, has created increased pressure to sell private forestland for development.

Limiting Factors. There are physical barriers, both natural and built, in the environment that affect the health of our ecosystems. Fish passage at diversions or in-channel obstructions (dams), stream conditions (channel complexity, low flows, etc), climate change, land-use practices, water withdrawals and discharges, invasive species, and poor water quality all contribute to the list of challenges facing our ecosystems. Because there is so much protection and restoration to do, efforts are often project-oriented or site-specific with very little strategic investment. The focus of these efforts has been on the condition of individual streams, stream segments, or sites, rather than on the entire watershed.

Protecting against Invasive Species. According to the Oregon Invasive Species Council, an invasive species is a non-native species that can cause economic or environmental harm to human health. It can be a plant, animal or

any other biological viable species that enters an ecosystem beyond its native range. Invasive species disrupt the natural function of an ecosystem by competing and replacing native species and disrupting the natural habitat. Oregon's rivers, lakes, and streams are greatly affected by their presence. Invasive species can interfere with water use by reducing flow in irrigation canals and drainage ditches, which can result in flooding and damage to canal banks, structures and pumps. Municipal use and power development are also impacted by invasive species, which can cause problems in water intake pipes, filtration equipment, and generation plants. Certain species of cyanobacteria, commonly referred to as blue-green algae, can be both invasive and toxic. It can form thick foam or scum on the water's surface and produces toxins or poisons that can cause serious illness or death in pets, livestock, wildlife, and humans. In short, the presence of invasive species is wide-ranging, affecting our forests, farms, and waters, which in turn affects our economy, ecosystems, human health, and overall quality of life.

Improving Water Quality. One of the most widespread water quality impairments throughout Oregon is temperature. Elevated temperature levels in rivers and streams can cause problems for fish and other aquatic life. A common way to address temperature issues is through the retention and restoration of riparian areas. Other pollution problems, such as sedimentation and turbidity, can also be addressed with riparian restoration programs. Of additional concern are toxic pollutants, which are diffuse in the environment, often come from "non-point sources," and pose a significant management challenge. To address this, DEQ is developing a toxics reduction strategy, with the goal of using a comprehensive approach to reduce toxic pollutants in Oregon's environment.

PUBLIC HEALTH AND SAFETY

Every community in Oregon has a responsibility to protect natural resources in such a way that ensures the health of its citizens. One of our most precious natural resources is water and keeping it safe and available is key to protecting public health. The quality of our water also affects the food we consume, such as fish, oysters, clams and mussels. Water system operators and the Oregon Health Authority are instrumental in making sure the water that enters our homes is safe for consumption and use. Likewise, various state agencies help Oregonians determine when it is safe to eat fish and shellfish from Oregon's rivers, lakes and oceans.

Safe Drinking Water. On average, a person will consume more than a quart of water each day. Some drinking water contaminants, such as bacteria, can cause acute health effects that occur within a few hours or days. Prolonged exposure to chemical contaminants, such as lead or arsenic, can cause cancer or organ damage. Public water systems, with state oversight, are a key protector of public health. Approximately, 88 percent of Oregonians rely on Oregon's 3,500 public water systems as a primary drinking water source. These public water systems are fed by more than 200 surface water diversions and 3,000 groundwater wells. Protecting the sources of water from contamination, combined with treatment, are important components of protecting public health. Waterborne disease outbreaks in Oregon have fallen dramatically from 15 in the 1970s, to two during the 2000s, because of the oversight and protection standards public water systems must meet.

Food Consumption. Many Oregonians consume locally caught fish and shellfish. Unfortunately, some of these species accumulate toxic chemicals because of spills or toxic algae blooms, posing health risks to those who consume them. The Oregon Department of Environmental Quality (DEQ) establishes the level of protection needed to ensure public health, by setting water quality standards and establishing fish consumption rates that are safe for humans. DEQ recently worked with partners and other agencies to revise the fish consumption rate and water quality standards.

The Department of Human Services (DHS) also protects public health by issuing fish consumption advisories, primarily because of moderate-to-high mercury levels and PCB's (polychlorinated biphenyls) found in the state's rivers and reservoirs. The Oregon Department of Agriculture and Oregon Department of Fish and Wildlife jointly issue shellfish safety closures to protect recreational shellfish harvesters from consuming clams or mussels contaminated with harmful biotoxins.

Recreation. Public health and safety concerns associated with recreational use of lakes and other waters have been growing over the past several years. When toxic algae blooms are detected in the water, activities such as swimming, wading, or water-skiing should be avoided. The Oregon Beach Monitoring Program (OBMP) monitors recreational water quality at ocean beaches. OBMP works with other state agencies to collect and test water samples, and when bacteria levels are above normal, a water contact advisory is issued. The goal of the OBMP is to protect the public health by providing information about water quality, strengthening water quality standards at beaches, and promoting scientific research.

In 2009, the Oregon Department of Fish and Wildlife hosted a recreational shellfish-harvesting workshop in Newport. Pacific Rock crab pictured above, courtesy of ODFW.

TOOLS TO PROTECT OREGON'S ECOSYSTEMS

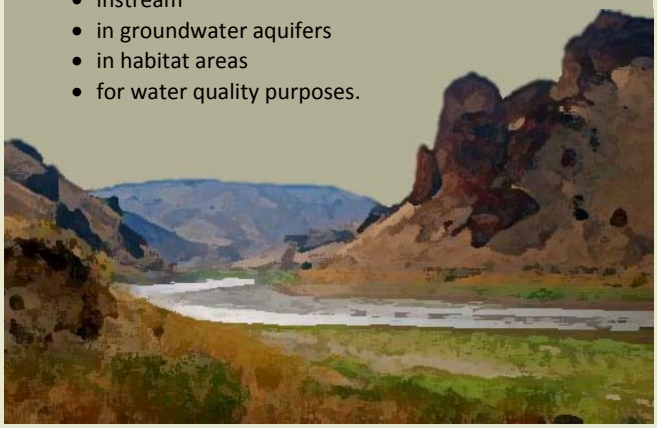
Oregon's natural resource agencies share similar goals and missions — to protect, enhance, and to maintain Oregon's forests, watersheds, wetlands, estuaries, fish and wildlife, and other natural resources. State and federal agencies work in partnership with statewide organizations, landowners, and watershed groups to meet these goals.

Water & Road Construction

The Oregon Department Transportation (ODOT) is an important partner in protecting ecosystem health. The primary water-related issue for ODOT is how to treat and where to put excess water, generated as run-off from roads and other impermeable surfaces.

The management of such water could be more strategic if ODOT had: (1) more information about where water was most needed and (2) the tools to treat and move water to those locations. ODOT could potentially supplement water in the following ways:

- instream
- in groundwater aquifers
- in habitat areas
- for water quality purposes.



Legislative Protections. Oregon's Scenic Waterway Act has led to one of the most extensive scenic waterway systems in the country, with more than 1,100 river miles permanently protected to benefit recreational uses, and fish and wildlife needs. The Federal Wild and Scenic Waterways Act has also contributed to the protection of instream values. Instream water rights and scenic waterways are well-established tools that bring economic benefits by attracting tourism, while at the same time protecting water quality and quantity and other ecological values.

Under Oregon's Instream Water Rights Act, state agencies responsible for protecting fish and wildlife, water quality, and recreation (ODFW, DEQ, and OPRD) have filed for and obtained more than 900 instream water rights. Many landowners and non-profit organizations have been instrumental in restoring streamflows, using state programs to transfer diverted water to instream uses, resulting in nearly 1,700 cubic feet per second of water protected instream. This is more than triple the amount for the states of Washington, Idaho, and Montana combined.

In addition, Oregon's Allocation of Conserved Water Program, Groundwater Quality Protection Act,

Agricultural Water Quality Management Act, Oregon Forest Practices Act, Oregon Conservation Strategy, and the Oregon Plan for Salmon and Watersheds are a few of the many statutory tools available today that benefit water resources, ecosystem needs, and services. Federal laws, such as the Endangered Species Act, Safe Drinking Water Act, and the Clean Water Act, serve similar purposes.

Project Investments. These investments in ecological protection and restoration have yielded many successes. Oregon has become a recognized leader for streamflow restoration projects. The Oregon Watershed Enhancement Board is the largest provider of non-federal restoration funds in Oregon. The amount of funding reported for restoration projects under the Oregon Plan has almost tripled since 1997, when funding neared $48 million. In 2008-2009, total funding was more than $130 million. The actions and willingness of private citizens to implement voluntary restoration projects has been and will continue to be fundamental to the success of the Oregon Plan for Salmon and Watersheds. For 2008 and 2009, more than 1,000 projects were completed and reported on private land. During that same period, landowners enrolled more than 11,000 acres in state and federal partnership programs to improve riparian conditions for fish habitat and water quality.

Although the Oregon Water Resources Board is a large provider of restoration funding, several other state and federal agencies provide funding as well. The USDA Natural Resources Conservation Service, National Fish and Wildlife Foundation, the Oregon Departments of Fish and Wildlife and Environmental Quality, the U.S. Environmental Protection Agency, the U.S. Forest Service, and the U.S. Fish and Wildlife Service are actively funding watershed restoration projects throughout the state.

Draft Recommended Actions

The following *draft* recommended actions are aimed at meeting ecosystem health needs and our public health needs. These actions reflect themes and ideas heard from Oregonians during the 2010 Open House events, stakeholder workshops, Policy Advisory Group meetings, and online surveys. Each numbered action has a series of bulleted items below it, meant to give an idea or example of how such an action could be implemented.

You may also see these symbols following a recommended action:

= Key, high priority, concept
= Ongoing need for applied research
= Legislation or rule-making likely required

[ ] = Contains more information, such as identifying lead or coordinating agencies or cross-referencing to other actions.

Your feedback on these actions, the bulleted items, and the related symbols is very important to us. Please send any comments or questions directly to the IWRS Project Team at waterstrategy@wrd.state.or.us by Wednesday, August 31, 2011.

ACTION 12.A. RESTORE NATURAL STORAGE AREAS

The function of these natural storage features has been lost over time due to stream channeling, land grading, and other activities. Do more to protect these systems during land-use planning.

- Maintain forested areas. Promote the maintenance of forestland in forest uses and promote the establishment of new forests as key elements in promoting high quality water and protection of soil productivity. (Oregon Department of Forestry's Draft 2011 "Forestry Program for Oregon")
- Develop a rapid assessment methodology, to determine storage capacity and system health of wetlands and streams. Local governments could use these assessments to make permitting decisions, evaluate the effectiveness of mitigation and restoration practices, and bolster their efforts under Statewide Planning Goal 5. [DSL – USACE – US EPA]
- Develop a statewide riparian policy, building upon language that exists in executive order. Draw upon already existing authorities at ODA, DSL, DEQ, ODF, and local governments to protect riparian areas.
- Develop a statewide floodplain policy, to set the framework for regulation and permitting work. [DSL, State, Federal, Local]

- Restore floodplain functions (Action 3.8 in ODFW's Conservation Strategy). Reconnect rivers and streams to their floodplains; restore stream channel location and complexity; remove dikes and revetments; allow seasonal flooding; restore wetland and riparian habitats; and/or remove priority high-risk structures within floodplains.

ACTION 12.B. PURSUE ADDITIONAL INSTREAM PROTECTIONS [contingent upon implementing Action 3.A]

- Recommend the designation of additional scenic waterways. [OPRD]
- Apply for new instream water rights, including those that protect a suite of flows (base, peak, ecological and other flows). [DEQ, ODFW,OPRD]
- Expand programs to restore streamflows, such as instream transfers and related OWEB grant programs.
- Private sector funders could acquire water from willing sellers to restore and protect water instream. Evaluate the pricing of such efforts; ensure they are economically competitive with other uses of water.

ACTION 12.C. IMPROVE POLLUTION PREVENTION

- Reduce the Use of Toxics
  - ~ Establish an interagency toxics chemicals reduction team that is charged with developing a list of "toxic chemicals of concerns" and a toxics use reduction strategy. Identify specific actions the state can take to reduce releases of and exposures to listed chemicals.
- Sourcewater Protection
  - ~ Establish "take back programs" for unused and outdated products, including pharmaceutical take-back programs for communities, pesticide collection programs for farmers and ranchers, and hazardous waste. [See Action 8.A]
  - ~ Provide technical and funding assistance to clean-up contaminated aquifers
  - ~ Ensure consistent riparian buffers and restoration requirements for all land uses.
  - ~ Encourage techniques that decrease turbidity and sedimentation (e.g., no till farming).
  - ~ Promote consistent application of state water quality standards across land uses.
  - ~ Encourage the Oregon Treasurer's Office and Department of Administrative Services to incorporate water quantity and water quality issues into investment and purchasing decisions. Use state and local purchasing power to demonstrate preference for products made without toxic or persistent pollutants, such as certain soaps or cleaners.
  - ~ Continually improve water quality standards, including the Priority Persistent Pollution list (P3), Total Maximum Daily Loads (TMDLs), new water quality standards for toxics, non-point source pollution, and toxic reduction plans.
- Prevent and Eradicate Invasive Species
  - ~ Support efforts by state and federal agencies, including the use of boat inspections stations, to prevent the spread of invasive species. More specifically, support the Oregon Conservation Strategy's six statewide actions aimed at preventing new introductions, and the scale and spread of infestations.

ACTION 12.D. IMPROVE HABITAT AND HABITAT ACCESS FOR FISH

- Build on the successes of habitat improvement, including large wood placement or riparian improvement.
- Build on the successes of the Oregon Plan for Salmon and Watersheds by removing fish passage barriers (e.g., replacing culverts with bridges, installing larger culverts, construction of fish ways, and stabilization of road fill material, installing fish screens, and retiring push-up dams).

Online Resources for More Information

Below are useful resources that contain additional background information on this topic. With the exception of our own publications and sites, the IWRS Project Team makes no endorsement of the information provided below.

REPORT: ECONOMIC IMPACTS OF FOREST AND WATERSHED RESTORATION IN OREGON
This link will take you to the University of Oregon, Ecosystem Workforce Program's study mentioned in the introductory paragraph of this bulletin. http://www.oregon.gov/OWEB/MONITOR/job_creation_local_economies.shtml

REPORT: OREGON'S 2000 STATE OF THE ENVIRONMENT (RIPARIAN AREAS)
Provides a summary of the status and health of Oregon's riparian areas, also referenced in this bulletin.
http://oregon.gov/DAS/OPB/docs/SOER2000/Ch3_5.pdf

OREGON'S WETLANDS PROGRAM
Administered by the Oregon Department of State Lands, which recently completed the earlier referenced study with the U.S. Fish & Wildlife Service on Wetland and Land Use Change in the Willamette Valley.
http://www.oregon.gov/DSL/WETLAND/index.shtml

OREGON CONSERVATION STRATEGY
Developed in 2006 by the Oregon Department of Fish and Wildlife, the Strategy is a blueprint for conservation of the state's native fish and wildlife and their habitats. The Strategy provides information on at-risk species and habitats, identifies the key issues affecting them and recommends actions. The Strategy includes actions that address water quality and water quantity. http://www.dfw.state.or.us/conservationstrategy/

THE OREGON PLAN FOR SALMON AND WATERSHEDS
In 1997, with the support and participation of a wide spectrum of stakeholders from all sectors and regions of the state, the Oregon Legislature and Governor established the Oregon Plan for Salmon and Watersheds. Motivated at first by the conviction that Oregon must devise its own homegrown response to listings of Coho and other salmon species under the federal Endangered Species Act, the plan quickly evolved and expanded into an unprecedented statewide program to preserve and profit from Oregon's natural legacy. http://www.oregon-plan.org/OPSW/

THE OREGON NETWORK OF WATERSHED COUNCILS
The Network supports the work of Oregon's watershed councils to enhance watershed health and benefit their local communities. The Network offers information about watershed restoration funding opportunities on their website.
http://oregonwatersheds.org/generalgrantops

2009 DEQ REPORT: HIGH LEVEL INDICATORS OF OREGON'S FORESTED STREAMS
(Referenced in this bulletin). http://www.deq.state.or.us/lab/techrpts/docs/10-lab-003.pdf

STREAMFLOW RESTORATION ACCOMPLISHMENTS
A 2009 fact sheet highlighting recent accomplishments for restoring and protecting water to benefit instream needs.
http://www.oregon.gov/OWRD/LAW/docs/Legislative_Updates/2009_Instream_Accomplishments.pdf

OREGON INVASIVE SPECIES ACTION PLAN
Developed in 2005 by the Oregon Department of Fish & Wildlife, this action plan describes the 100 most dangerous invaders in Oregon, potential economic impacts, and a generic action plan for new invasive species.
http://oregon.gov/OISC/docs/pdf/oisc_plan6_05.pdf

INVASIVE SPECIES - FREQUENTLY ASKED QUESTIONS
The Oregon Invasive Species Council's website answers several questions regarding Oregon's invasive species.
http://www.oregon.gov/OISC/faqs.shtml

OREGON'S STATEWIDE PLANNING GOAL 5
Learn more about Oregon's land use goal that is aimed at protecting natural resources, conserving scenic and historic areas, as well as open spaces. http://egov.oregon.gov/LCD/docs/goals/goal5.pdf

OREGON'S FISH SCREENING PROGRAM
Administered by the Oregon Department of Fish and Wildlife, this website offers information about the history, status, and current challenges facing the fish screen program. http://www.dfw.state.or.us/fish/screening/

THE OREGON ESTUARY PLAN BOOK
The Oregon Estuary Plan Book provides information about Oregon's seventeen largest estuaries.
http://www.inforain.org/oregonestuary/index.html

FORESTRY PROGRAM FOR OREGON
The Forestry Program is the Board of Forestry's strategic plan, maintained on an eight-year cycle, with the next update due in 2011. The draft Forestry Program for Oregon update proposes specific goals and objectives to address the current problems, and to set forests on a pathway to provide a steady flow of multiple benefits for Oregonians.
http://www.oregon.gov/ODF/BOARD/fpfo2011.shtml

FOREST FACT SHEETS
The Oregon Forest Resources Institute hosts a mini website answering the most commonly asked questions about Oregon's forests. http://oregonforests.org/FactsAndResources/ForestFacts.html

A RECREATIONIST'S GUIDE TO RIPARIAN AREAS
A Pacific Northwest Extension publication, providing a summary of what activities you should do to minimize impacts on riparian areas when out enjoying the streams and rivers throughout the region. Relevant to campers, hikers, bikers, fishers and floaters, motorized craft users, and those traveling with animals.
http://extension.oregonstate.edu/catalog/pdf/pnw/pnw561.pdf

WATER QUALITY ASSESSMENT REPORT FOR OREGON
Find information on water quality conditions reported by Oregon to the U.S. EPA under Sections 305(b) and 303(d) of the Clean Water Act. http://iaspub.epa.gov/waters10/attains_index.control?p_area=OR#total_assessed_waters

NOTE: See 2011 Discussion Draft for latest version of Recommended Actions

Oregon's Integrated Water Resources Strategy

DRAFT RECOMMENDED ACTIONS - AT A GLANCE - JUNE 23, 2011

Understand Water Resources Today

1. Understanding Oregon's Water Resources/Supplies

1a. "map" Oregon's water-related institutions
1b. fill in data gaps in specific issue areas

Understand Both Instream & Out-of-Stream Needs

2. Understanding Oregon's Out-of-Stream Needs

2a. update long-term water demand forecasts
2b. improve water-use measurement
2c. complete water right adjudications

3. Understanding Oregon's Instream Needs

3a. understand flows needed to support stream functions
3b. understand relationship between groundwater & ecosystem needs

Understand Coming Pressures that Affect Our Needs and Supplies

4. The Water-Energy Nexus

4a. analyze effects on water demand from energy development policies
4b. take advantage of water infrastructure to develop hydroelectric power
4c. increase energy efficiency & renewable power production @ water facilities
4d. promote strategies that conserve energy and water

5. Climate Change

5a. support continued climate change research efforts
5b. develop climate change scenarios/models
5c. assist with climate change adaptation strategies

6. The Water and Land-Use Nexus

6a. ensure local governments have access to data needed for decision-making
6b. develop land-use scenarios / models
6c. fully integrate water information into land-use planning (& vice versa)

7. Water-Related Infrastructure

7a. encourage regional (sub-basin) approaches to water/ww systems [10a]
7b. develop and upgrade water & wastewater infrastructure
7c. improve dam safety

Meet Oregon's Instream and Out-of-Stream Needs

8. Education and Outreach

8a. provide improved public access to information
8b. encourage the next generation of water experts

9. Funding the Development and Protection of Oregon's Water

9a. establish a water management fund for the state
9b. capitalize funds for local water projects
9c. coordinate state & federal funding programs

10. Place-Based Approaches

10a. encourage regional (sub-basin) approach to water/ww systems [7a]
10b. participate in transboundary agreements
10c. facilitate regional (sub-basin) water resource planning

11. Water Management

11a. increase water conservation & water efficiency
11b. increase built storage
11c. encourage additional water re-use
11d. assist in the development of ecosystem credits and markets

12. Ecosystem Health and Public Health Needs

12a. restore natural storage areas
12b. pursue additional instream protections
12c. improve pollution prevention
12d. improve habitat and habitat access for fish

KEY:
Key, high priority, concept
Ongoing need for applied research.
Legislation or rule-making likely required

[ ] = Contains more information, such as identifying lead or coordinating agencies or cross-referencing to other actions.